

BEYOND SURFACES



Oerlikon Balzers and Oerlikon Metco

Shared passion for surfaces
– and beyond

Oerlikon Surface Solutions

oerlikon
balzers

oerlikon
metco

Editorial



IMPRINT

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Responsible for content

Alessandra Doëll,
Head of Communications

Editor-in-Chief

Agnes Zeiner, Senior Customer
Communication Manager

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beyond.surfaces@oerlikon.com

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Dear readers,

149 sites. 145 service and production centres. 37 countries. Over 6,100 employees. More than 80 years experience. This is the Oerlikon Group's Surface Solutions Segment, under whose roof the Oerlikon Balzers and Oerlikon Metco brands have been working together for almost two years. In the course of these two years the portfolio of the two brands has been continually expanded by complementary technologies, competencies and target markets, and the Segment has emerged as a leading global provider of surface solutions for components and tools for a variety of industries.

Today you are holding the first issue of our customer magazine in your hands. Because we feel the Surface Solutions Segment story is worth telling. BEYOND SURFACES tells it – in stories for, and about you, our clients; in stories that are focused on our shared passion: Surface Solutions.

BEYOND SURFACES shows you, how, and for what our heart beats, and how people, markets and technologies merge to create this successful “story”, which is lived each and every day and with great passion within the Surface Solutions Segment.

I wish you an enjoyable read.

Alessandra Doëll

Head of Communications

PS:

If you would like to send us your story, or just provide feedback about BEYOND SURFACES, our editorial team will be pleased to receive your message at beyond.surfaces@oerlikon.com ●

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Viewpoint

Interview with Dr Roland Herb

Two brands, one segment: together actively shaping the future

In early June 2014, the Swiss Oerlikon Group announced the acquisition of the coating specialist Metco. Since then, the two coating specialists Balzers (part of Oerlikon since 1976) and Metco together constitute the Surface Solutions Segment within the Oerlikon Group. This has produced a global coating solutions technology leader. As its CEO, Dr Roland Herb is responsible for more than 6,100 employees at 149 sites, and more than 145 coating centres in 37 countries, which generate turnover exceeding 1.2 billion Swiss Franks.

Dr Herb, you and Oerlikon Balzers, which is a part of the Surface Solutions Segment managed by you, are united by an almost 20 year shared history. What were the personal highlights of this journey for you?

At the start of my professional development during the 1990's and early 2000's, every discussion revolved around the IT and semiconductor sectors. I was personally, however,

much more interested in Oerlikon Balzers, as the name stood, after all, for pioneer work in the area of industrial tool coating. I joined Oerlikon in 1997 and since then have played an active role in shaping the company's development. I was for example involved in Oerlikon Balzers first steps in component coating. Looking back I can say: Each phase was, in itself, both exciting and interesting. The developments

moreover continue, and will make the company even more interesting.

The 2nd of June 2014 is of course very vivid in my memory. Not only because of the announcement of the Metco acquisition, but also because I was named CEO of the newly created Surface Solutions Segment. This was, without doubt, one of the most exciting days in my professional life – faced with the incredibly thrilling task of bringing

“As CEO I am proud that innovation is one of the Surface Solutions Segments’ success factors. We are continuously developing.”



together two companies and making a global technology leader out of two coating specialists.

And have you been successful?

You can well imagine that I would like to answer you with a simple “Yes” ! That is unfortunately not (yet) possible – in any event not without reservation, since even after almost two years a task of this sort is naturally not yet completed.

It is quite clear though that this fusion of two coating pioneers has created a global coating solution technology leader: Balzers and Metco cover the entire spectrum, ranging from heat treatment, through thin film coatings to thicker coatings, and are active in more than 40 industries. Much has also happened with respect to the convergence of the two brands. I can therefore say: Yes, we have been successful: we are on the right track

and have already posted many successes.

How do these look in concrete terms?

We are creating synergies at all levels. This starts with small initiatives, though we also have projects affecting nearly every employee within the Segment. Internally this means that important functions have now been set up at the Segment level, and work for both brands. This has made these areas very efficient and raised teamwork to an entirely new level.

In this first issue of our new customer magazine BEYOND SURFACES we also present several projects in which Balzers and Metco teamwork is also apparent for our customers, and from which they of course profit. Our new BALINIT

CROMA and CROMA PLUS coatings for example: originally developed by Metco, these have been transferred to Balzers systems and are thus now globally available. Which means: we now offer Balzers’ customers a new coating family, and Metco customers profit from a global service network, through which the coatings are soon globally available. In autumn we opened the first joint factory in Guelph in Canada, that in particular serves customers from the automotive and

Viewpoint



aerospace sectors located there. And our new METAPLAS.DOMINO coating system not only testifies to the successful integration of the Metco thin film business into Balzers, but also to the synergies arising in coating systems.

So all big projects that were got off the ground in the last two years ...?

That's right – in the last year alone, our integration project teams completed more than 15 very large and strategically important projects, which of course also have a positive impact on our balance sheet.

At least equally important in my mind, however, are the synergies that arise at a very personal level, and are not listed in any business plan. For me as CEO they are, however, a sign that employees of both brands are consciously living and advancing this integration. Just one example: An employee of our Balzers France branch was working with a customer on a coating solution. After a discussion showed that Metco expertise would be a valuable addition to the project, he contacted his Metco colleagues and

together they were able to offer the customer a perfect solution – and, moreover, a lasting solution, because the customer may also want to make further investments. This is precisely the proactive type of approach that will make the merger of Oerlikon Balzers and Oerlikon Metco a success.

At a personal level: You are a doctor of physics and now responsible for more than 6,100 employees. Do you like your role as CEO of the Oerlikon Surface Solutions Segment? And do you actually still have time to be involved in research projects?

This is something that's hard for me to answer, because I have two souls in my breast. As a physicist I have to admit that I am sorry to be often only marginally involved in our exciting research projects. My education and experience of course nonetheless help

me enormously to monitor developments, set priorities for our research department, and to make necessary decisions.

As CEO I am proud that innovation is one of our Segments' success factors. We are continuously developing – with new technologies, industries and markets, we are growing as a company and setting industry standards – what could be more exciting? Of course growth by itself is not enough. It must also be sustainable, in order to safeguard the future of the company and the jobs it provides. Because as you say – I am ultimately also responsible for the well-being of our more than 6,100 employees who contribute to the realization of our goals. We are all united by a passion for our industry, and for the Balzers and Metco brands. One of my most important tasks as CEO is to nurture and safeguard this passion.



ABOUT

Dr Roland Herb

Dr Roland Herb is the CEO of the Oerlikon Group's Surface Solutions Segment, which, since June 2014, has united the sister brands Balzers and Metco. The German native worked, from 1997, in various positions and departments at Oerlikon – amongst these project management, R&D and product management – before assuming substantial responsibility for the positioning of Balzers in the coating area as manager of Oerlikon Balzers' strategic Business Units Tools, Forming Tools and Components. From 2010 through 2014, Dr Roland Herb managed the Tools Business Line, which remains one of the company's most important mainstays. Dr Roland Herb, born in 1963, studied Physics at Tübingen University and, prior to joining Oerlikon, was a research associate at the Naturwissenschaftliches und Medizinisches Institut (NMI) in Reutlingen (Germany), and afterwards product development manager at Buck Plasma Elektronik in Neuenburg (Switzerland).

The Surface Solutions Segment offers an enormous spectrum of surface solutions. How do you actually maintain an overview?

My physics studies definitely come in very handy here! A core aspect of the creation of the Surface Solutions Segment was the high degree of complementarity of the Balzers and Metco offerings. It is very interesting and exciting to now bring these two technologies together, to develop new solutions by combining them, to shift the existing limits of the technology, and enable totally new approaches and thus solutions for our customers. We are pioneers by tradition, have already set new standards in the history of the coating industry, and will continue to do so in the future.

What does the future of the Segment look like?

Our Segment brings in the highest revenue in the Oerlikon Group. In November, Group Management announced that Oerlikon is to blaze new

trails to create long-term added value for shareholders. The Group is thereby betting on the strengths and potential of the Surface Solutions business. Reduced energy consumption, responsible use of resources and increased performance are themes which will occupy us in the coming years and decades, because megatrends, such as population growth, increasing energy needs, and growing mobility are rapidly changing our world. New and intelligent materials and surfaces will play an important role as solutions for these trends become necessary. The merger of Oerlikon Balzers and Oerlikon Metco has enormously expanded our Segment's target market.

A few months ago we opened up a new strategic business area based on Oerlikon Metco's long-standing expertise in the area of metal-based powders. For this we created a separate Business Unit 'Additive Manufacturing' in order to develop the business, the production portfolio, R&D and partnerships in this rapidly emerging market. Probably the best known application in additive manufacturing is 3D-printing. We are convinced that this stepp will expand our target market by a factor of 20 % to 11 billion Swiss Francs.

Dr Herb, thank you for this interview. ●



Reaching new heights with Metco

Proven technology for One World Trade Center

Drytec Trans-Canada, a long-standing Oerlikon Metco customer and paint and grit blasting expert, relied on the Metco 16E wire combustion spray gun for the zinc coating of the spire of One World Trade Center in New York.



Despite its robust construction, the Metco 16E wire flame spray gun weighs only 2.5 kg, and thus is ideally suited for mobile use – even for the nearly 140 metre high and 680 tonne heavy spire of One World Trade Center.

The contract to corrosion protect the tower's spire was awarded to Drytec Trans-Canada by the New York and New Jersey Port Authority, which owned the building at the time. From the outset it was clear to all involved that the sheer size of the workpiece posed an enormous challenge. The original plan to galvanize the high-strength steel was quickly dismissed, in view of the immense size of the spire components, the varying thicknesses and requirement for double dipping. Painting was also not an option, as the binders in the paint would have interfered with satellite communications. A pure zinc coating was chosen as this could provide the required conductivity, as well as achieve the required coating thickness of between 250 and 500 µm.

The search for a process

The next step was to find a process able to fulfil the coating thickness requirements and to accommodate the spire's highly complex geometry. Ultimately the Drytec team presented flame spray technology to the building owners and then spent nearly a year testing the equipment.

Oerlikon Metco's Key Account Manager was also contacted at this time, because Drytec was confronted with another challenge – the required coating bond strength of 4.8 MPa. Drytec, moreover, had to submit a process description to the New York City Inspector precisely documenting each step of the coating process, and describing the measures to prevent overspray, i.e. excess spray not applied to the workpiece.

“I don't want to have to climb up there with a can of paint in a few years time to touch up the structure!”

The City Inspector to Oerlikon Metco's Key Account Manager.

Metco solution fulfilled all requirements

Shortly afterwards, Oerlikon Metco presented the capabilities of the Metco 16E combustion spray gun with zinc wire to the New York City Inspector at Drytec headquarters – and won him over completely. An adhesion strength of 8.3 MPa on all spire parts was actually achieved, thanks to the outstanding combination of spray equipment and spray material. The required coating specifications, SSPC SP10 and SSPC-CS23, the norm for thermal spraying (ISO 2063) and, of course, the customer's required coating thickness, could all thereby be fulfilled.

Seventeen sections to objective

Having found the right process, the work could start. The lower six spire sections were too bulky and too heavy to be transported, so Drytec rented a hangar near the port to perform the final metallization. The individual sections were delivered in three parts and welded together on site. The application of the zinc corrosion coating required the simultaneous use of three wire combustion spray guns. Drytec kept six of these guns on hand at all times to enable any necessary maintenance to be performed without disruption to the coating process.

Seventeen sections, some comprising nested tubes, had to be zinc-coated. For some, hard-to-reach areas, an extension module – the Oerlikon Metco XT6-18T 45-degree-tilt angle spray gun – was needed.

Absolutely convincing

Especially challenging was the narrow available time window between abrasive grit blasting and the application of the zinc coating, due to the rapid corrosion of high-strength steel: the coating had to be applied within four hours after grit blasting. Drytec used a total of 11,500 kg of zinc wire to coat the 139.6 metre high spire.

The Key Account Manager likes to recall the City Inspector's reaction to his presentation: "He said to me: I don't want to have to climb up there with a can of paint in a few years time to touch up the structure! If one of your customers should ever doubt the quality of this process, just tell him that the spire of the World Trade Center was coated using a Metco 16E and zinc wire." ●



DRYTEC Trans-Canada

The company with headquarters in Quebec (Canada) is a specialist provider of services in the area of surface treatment and corrosion protection. As well as standard

services, it also offers special coating solutions for complex steel components. In 2013, Drytec was commissioned to corrosion protect the 139.6 meter high spire of One World Trade Center.



Innovative metallization of plastic components

Bright prospects for the environment





Everything that sparkles, glitters and shines attracts the attention of us humans. Not for nothing are products containing attractive metal-look components in vogue, and often perceived to be of high quality. Cars and electrical devices, the kitchen and the bathroom all contain fine chrome-look plastic parts. The commonest chrome plating methods however pose hazards to the environment and people, especially the chromium (VI) compounds used in galvanic coatings. From 2017, the European Union REACH regulation shall prohibit the use of chromium (VI) compounds. Oerlikon Balzer's new ePD technology metallizes plastic parts in an environmentally and health-friendly way.



The INUBIA system allows seamless integration of ePD technology into the industry's production lines.

Metallized plastic parts have the same high quality appeal as chromium-plated metal components. To date, galvanic processes have been chiefly used in their manufacture: this involves the application of metal ions to plastic parts in an electrolytic bath. Galvanization however requires both hexavalent chromium (CrVI) and nickel.

Functional and environmentally-friendly

Manufacturers from the automotive, electronics and sanitary industries are accordingly searching for sustainable alternatives. Oerlikon Balzers ePD technology enables eco-friendly, cost-efficient and resource conserving metallization of plastic parts. ePD moreover allows plastic parts to be given not only a high-gloss or matte metallic appearance, but also attractive metallic colour variations, as well as functional features, such as config-

urable light or radio transparency. The highest functional and decorative demands of industry and consumers are thus exceeded in many areas.

The so-called ePD process (embedded PVD for Design Parts) is environmentally-friendly, and requires no harmful chromium compounds or nickel. ePD generates no heavy metal waste or contaminated water. "We are working to get the European Chemical Agency ECHA, which is responsible for REACH implementation, to recognize ePD as an alternative process to galvanization and are confident of success," said Rüdiger Schäfer, General Manager ePD at Oerlikon Balzers, confidently.

Three layers for high stability

The ePD process applies three layers, with the metal layer sandwiched between two layers of lacquer: the lowest layer smooths out unevenness created by injec-



Zanini Auto Group

The Zanini Auto Group with headquarters in Barcelona (Spain) has a 50 year track record as a specialist for the development and manufacture of plastic components for the automotive industry and as a full service provider of external and interior vehicle parts. The company has more than 900 employees.



Nanogate AG

Nanogate is a leading international integrated system house for high performance coatings with around 550 employees. The group with headquarters in Göttelborn (Germany) enables the programming and integration of additional functions in materials and surfaces.

tion moulding, whilst the upper lacquer layer guarantees effective protection against environmental factors. The sandwiched metal layer is applied using the PVD process (Physical Vapour Deposition) which uses only eco-friendly substances. The process is furthermore resource-conserving. The applied metallic shiny surface is only around 0.2 micrometres thick. Galvanic coatings, in contrast, are up to 60 micrometres thick. ePD-coated plastic parts are, moreover, readily recyclable at the end of their product life cycle.

Interested customers

Zanini, a Spanish automotive supplier, already has an INUBIA P6, a fully automated painting line, and can thus offer ePD technology licensed from Oerlikon Balzers. "We see this as the beginning of a successful collaboration, as we plan to extend our capacities based on Oerlikon Balzers' ePD technology within further systems in Europe, the USA and China in accordance with market needs," said Xavier Serra Monté, Manufacturing and Engineering Director at Zanini, convinced of the advantages provided by ePD.

German Nanogate AG, a specialist for high-performance coatings is also betting on sustainable and environmentally friendly know-how from Liechtenstein: it will soon commission an INUBIA system. So equipped, Nanogate will be able to service the automotive market with metallised decorations and panels in large quantities. The system used by Nanogate has a modular design and provides the company with an individualized gateway to the technology. This modular approach simultaneously provides a great deal of flexibility for the future: Nanogate can extend the system at any time to increase productivity.

The future belongs to ePD

Oerlikon Balzers is betting that the ePD process will become the new industry standard for the metallization of plastic components over the coming years. "This is in every respect a substitute technology with an enormous potential in a strongly growing market," summed up Rüdiger Schäfer. ●

- You can find more information about ePD-Technology from Oerlikon Balzers at www.oerlikon.com/balzers/epd

FACTS & FIGURES

2017: EU-wide chromium ban

On the 17th April 2013, extension of Appendix XIV of the REACH regulation was announced in the EU official gazette (Regulation (EU) No. 348/2013). According to this, Chromic acid and Chromium (VI) containing compounds may only be used without authorization until the 21st March 2016.

Corresponding approval applications had to be submitted to the European Chemical Agency (ECHR) at the latest by the 21st March 2016.



Hot parts: Protective coating for thrust

Faster, lighter, hotter – the biggest challenges that engine developers face can be thus summarized. To reach them, aviation engineers rely on Oerlikon Metco coating solutions.

by Dieter Sporer

Ever since the first aircraft was built, engineers have been continually working on improvements and further developments. The engines in particular – as the heaviest parts – have the greatest influence on performance optimization. Not just reduced weight, but also higher engine working temperatures contribute to increased efficiency. This is achieved, in amongst other ways, by using materials which are lighter and more heat resistant than conventional metals, but introduce a range of new challenges. And it is precisely here that aviation developers count on the support of Oerlikon Metco and its coating solutions.

Fibre-reinforced into the future

Thermal sprayed surfaces ensure efficient engine operation, protect against corrosion and create a barrier to heat. This makes it possible to manufacture them using lighter materials that would otherwise be too delicate. These materials include, for instance, ceramic matrix composites (CMC). This fibre-reinforced ceramic is light, oxidation resistant and also extremely stable at high temperatures. The only weak point of this material: water va-

pour – a ubiquitous product of combustion processes. This is, however, also no longer a problem with coating, and the material is already present in the latest generation of engines.

Layer by layer

Another material with great potential is carbon fibre-reinforced composite (CFC). Lighter and cheaper than titanium, it's the perfect material for the fan blades and compressor casings of engines.

In some cases, however, CFC needs a wear and abrasion resistant coating in order to be able to survive the harsh environment in which aircraft engines operate. No easy task, because carbon fibre surfaces are not very heat resistant, and can thus be damaged by classical plasma and thermal coating processes. To prevent this, Oerlikon Metco works with complex intermediate layers which act as thermal barriers between material and final coat and thereby protect it against damage. To increase the efficiency and repeatability of applying these coatings, many customers are turning to Oerlikon Metco's cascading arc plasma spray technology.



Aircraft engines are subject to extreme loads, and one of the most important factors influencing aircraft performance. Oerlikon Metco developments significantly increase their efficiency.

Flexible thermal insulation

Efficiency is not only influenced by the materials used to build the engine components, but also by the material composition of the coatings used. A current example of this is provided by thermal barrier coatings (TBC), which are routinely used in combustion chambers. The coatings are characterized by ever lower thermal conductivity, which offers a higher level of heat protection to the underlying material. These coatings are compositionally and structurally highly flexible, which allows the layer structures to be optimally tailored for the components. The result: engines can be operated at much higher temperatures than without, or with conventional coatings.

Save resources – and time

With new materials and technologies, Oerlikon Metco is contributing to novel developments in engine manufacture. Because increased efficiency doesn't just boost thrust, but also conserves valuable resources – and reduces fuel consumption, which benefits both airline operators and passengers. ●



If in today's world, in which life is determined by excess and speed, a company's goal is an annual product volume of only 300 units, these must be very special products. The Swedish luxury watch manufacturer Halda's motto has been "Never compromise on quality" since 1887. No wonder they found a congenial partner in Oerlikon Balzers – on earth and in space.

The story of Halda is a long and steady one – a story of evolution, rather than revolution – that started almost 130 years ago, when Henning Hammarlund (who created his first watch out of wood as a teenager and went on to become a watch engineer) set out to create the perfect watch. Rapid progress followed, and

Hammarlund was soon famous for his watches: even the Swedish King Oscar II owned a Halda watch, bearing his portrait on the casing. Hammarlund's perfectionism soon drove him to design tools and machines precise enough to meet his sophisticated demands – accurate to 1/100 mm.

Perfection at all times. Always and everywhere.

These were not only the basis for the fame that he and his watches enjoyed, but also the foundation for the further development of the company, that manufactured also other highly accurate products: for decades, Halda taximeters were the only taximeters approved for London city taxis; August Strindberg, Ernest Hemingway and Astrid Lindgren wrote their masterpieces on Halda typewriters.

Awarded design and concept

Henning Hammarlund never deviated from his vision of perfectionism, and neither has his company, right up to the present day: “We never compromise on quality, ever!” says Mikael Sandström, Halda’s CEO. This might just sound like a simple statement, were it not for the two top of the line watches in Halda’s current portfolio. One for

earth, and one for space! The same stringency is moreover applied to design: last year the watches received several design awards in London, including the prestigious ‘Red Dot Design’ and ‘Watch of the Year’ awards.

Today’s ‘Halda Concept’ in essence comprises a time platform and interchangeable time modules. Each module is developed for optimal performance in its respective field and is exchangeable using the platform’s patented locking system. The ‘Space Discovery’, launched in 2011, was the first modern Halda. “After years of developing the Halda Concept, we set out to create a watch for the most extreme environment known – space, the ultimate challenge, the last frontier. Whilst the space pioneer needs a workhorse and has no need in space for an ornament, what, though, could be more beautiful than a work of art that is supremely functional?” asks Sandström.

The perfect choice for function and design

The interchangeable modules that lie at the heart of the Halda Concept must be resistant to wear and mechanical damage. The perfect solution was provided, in the form of BALINIT DLC, by Oerlikon Balzers. Sandström says: “The Halda and Oerlikon Balzers brands both stand for precision, innovative engineering and uncompromising quality.” BALINIT DLC, developed to enable engine components such as fuel injection systems, pistons, cylinders and valves to withstand the most extreme wear conditions and high relative speeds, proved to be the perfect coating for the Halda housing: “BALINIT DLC coated housings are scratch resistant, which is of the utmost importance to us, as the docking on and off of the two modules is the core feature of our concept. BALINIT DLC is moreover precisely the right colour – a crucial aspect for our design,” says Mikael Sandström.

From the space to the race track

Space was apparently not enough for the engineers at Halda. Their next challenge was to create the world’s first genuine racing watch, realized in the form of the ‘Race Pilot’ – a unique racing instrument co-developed with race engineers and tested by Formula One driver Marcus Ericsson. This Halda Concept watch also unites the traditions of mechanical watchmaking with the advantages of modern technology, including information from 150 of the world’s most popular racetracks, a race Chronograph, FIA Formula 1 Countdown and much more. ●

FACTS & FIGURES

The Space Discovery



The heart of the mechanical **Earth Module** is the most precise, automatic high performance mechanical New Old Stock (NOS) movement. Its counterpart, the **Space Module**, was developed together with Swedish astronaut Christer Fuglesang, who also tested it as a member of the Discovery

STS-128 mission crew. Cutting edge technology inside the TECAMAX™ case is driven by a low power consumption microprocessor for ultimate efficiency, which serves both, the LCD display and LED backlight, as well as the specific space functions: the G-Force sensor and the Particle Counter. A true astronaut’s instrument, exactly 128 Space Discovery watches have been produced, some of which are included in the outfit worn by European Space Association (ESA) astronauts.

BALINIT CROMA

Profit from Metaplas integration

BALINIT CROMA/BALINIT CROMA PLUS is the first coating family resulting from the integration of Metco into the Oerlikon Surface Solutions Segment, to be brought to market by Oerlikon Balzers.

Extremely thin PVD coatings can not only extend the service life of tools, prevent tool damage and reduce maintenance costs, but also reduce the use of coverings and release agents. They, moreover, improve the gliding behaviour of melted plastic on the tool surface. Both of the new, CrN-based coatings offer all of these advantages.

The new coating family, which comprises coatings branded under the names BALINIT CROMA and BALINIT PLUS in the Balzers portfolio, is a product of joint development. Teams from Balzers and Metco worked together to transfer the former Metaplas coatings, already used

successfully in plastics processing, to Balzers systems. Typical applications of both coating solutions are in the areas of extrusion and injection moulding of a variety of plastics.

Following successful transfer, the coatings are now for the first time globally available via the worldwide Balzer's coating centre network. Previous Metco/Metaplas customers thus profit from a vastly expanded service centre network, whilst Balzers customers have gained access to a new coating solution. ●

INNOVENTA mega

Productive and fast

The new INNOVENTA mega redefines productivity benchmarks. Now the largest coating system in the portfolio, it achieves extremely high throughputs with tools such as milling cutters or drills: average batch times of less than five hours are typical.

It can accommodate workpieces with heights of one metre or more and a swing diameter of 96 cm. With permissible load weights of up to 3,000 kg, it is an ideal platform for coating bulky moulds or sawblades.

The INNOVENTA mega can handle the entire repertoire of BALINIT coatings as well as tailor-made coating

designs for a wide range of applications. Rapid commissioning, simple operability, and a high level of reproducibility are further features.

On the bottom line, the INNOVENTA mega ideally complements Balzers' more compact INNOVA and INGENIA systems. ●



Protective coating for water turbines

Hydropower turbines are subjected to enormous forces and damage mechanisms. Over time, erosion and cavitation lead to major efficiency losses and a marked reduction in useful lifetime. To hinder this, turbine manufacturers rely on high-tech coatings from Oerlikon Balzers and Oerlikon Metco.

The demand for energy is constantly increasing, driven by population growth and increasing prosperity in emerging countries. One of the most environmentally-friendly types of energy generation is the use of hydropower – using run-of-river hydropower plants placed directly in the river course which constantly generate power, or pump-storage power plants (e.g. reservoirs), which are used to store energy for release upon demand – a function of ever increasing importance.

Decisive factor: Economic efficiency

Power plant operators are focused on ever higher turbine economic efficiency, through extended useful lifetime, longer inspection cycles and higher efficiency. At the same time, a growing number of new waterways, previously deemed too inaccessible, are now being tapped – often highly sandy rivers or waters with high head. Wear protection for individual power plant components is thus a key factor for the success of these projects.

Specialists for all cases

Oerlikon Metco provided the first coatings for Francis turbines in the 1930's, and, since the 1980's, has protected thousands of turbine runners in hydropower plants throughout the world with its thermal spray coatings, which can be up to 400 µm (0.4 mm) thick. The coatings are individually tailored – they are dependent on machine design, precise operating mode and specific operation conditions.

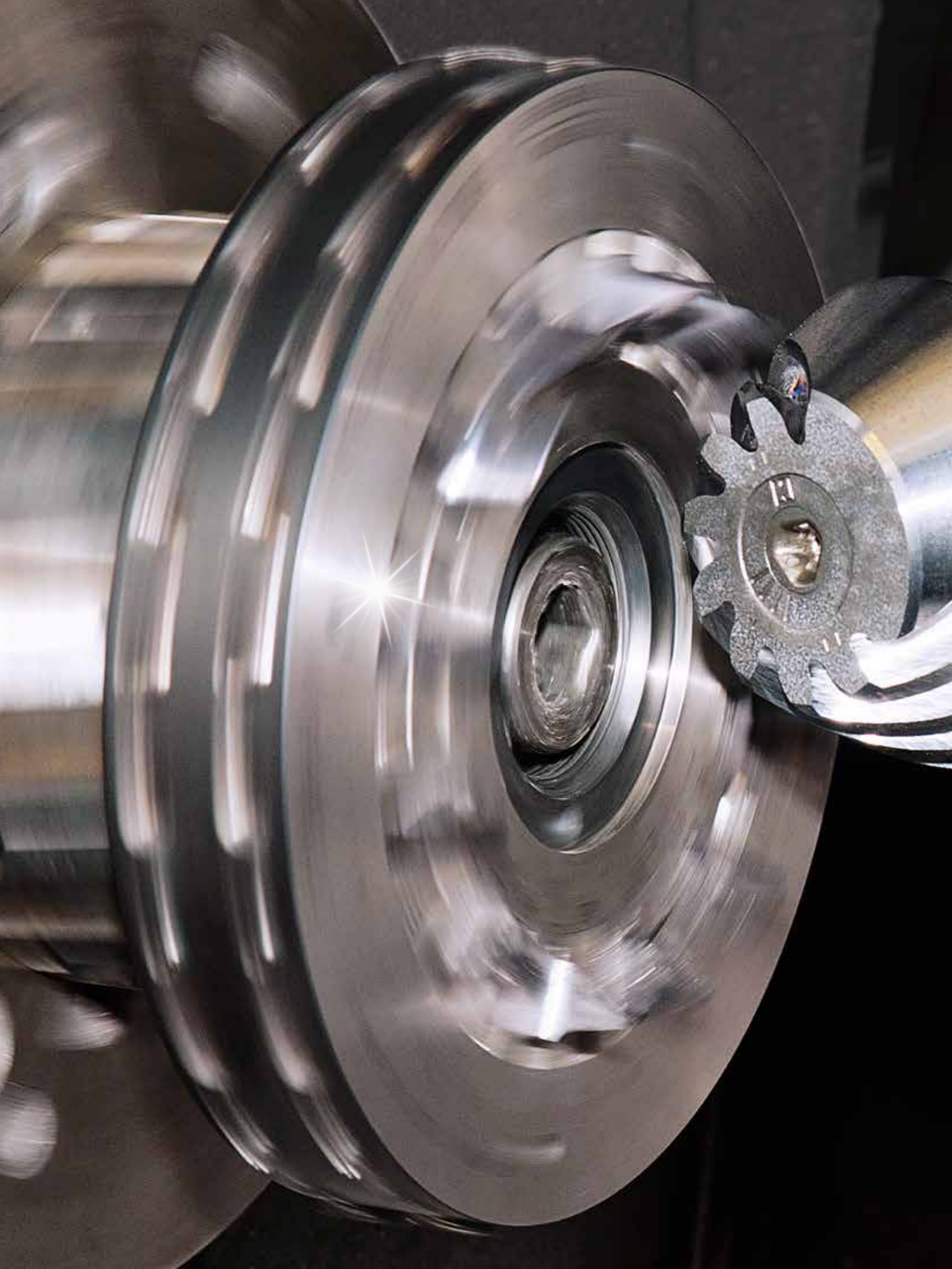
Oerlikon Balzers is, then again, a specialist for extremely thin PVD coatings. Not just cutting tools used to manufacture turbine parts are coated with BALINIT, but also bearings or valves in the overall system. The goal of both applications is to reduce wear caused by friction and thereby to increase efficiency. ●



FACTS & FIGURES

Individually tailored

The right coating not only enables extended service life, but also longer inspection cycles and higher efficiency. Both turbine design (Pelton, Francis, Kaplan) and operating conditions are crucial factors for the customization process. Pelton turbines are, for example, used in areas with high head (more than 100 metres) and small water quantities. In the opposite case – namely with lower head and large water quantities – a Kaplan turbine is generally used. The design of the latter makes it more susceptible to destructive cavitation, which affects both the choice of coating and the turbine parts to be coated. The choice of wear protection must also consider not just the amount of silt, sand and shingle that is carried along with the water, but also chemical contamination.





High-speed gear cutting with BALINIT ALTENSA

Broadened horizons for gear cutting

The development of tailored tool coatings plays an especially key role in increasing cutting speeds, raising productivity and lowering costs for demanding gear-cutting processes. The amazing performance dimensions that can now be achieved are demonstrated in customer tests of Oerlikon Balzers' BALINIT ALTENSA.

The manufacture of durable, low-noise and highly efficient gears, such as for transmission applications, is associated with enormous quality demands and a correspondingly high production effort. Industrial competition therefore demands both the shortest possible production times and low production costs. Actual gear cutting costs, which at about 30 percent (after machine set-up, cooling and manufacture) represent the biggest cost factor in production, can be most effectively reduced through higher cutting speeds.

Efficiency through longer service lifetime

Modern wear protection coatings increase tool service life and, thereby, also ultimately reduce setup costs. Their strengths are, however, above all displayed in cutting applications, in which they enable significantly higher cutting speeds. Oerlikon Balzers has decisively shaped the development of TiN coatings for gear cutting tools since their first introduction in the 1980's. "Today, more than 60 percent of all hobs worldwide, which are used first and foremost in the automotive industry, are coated with our AlCrN coating BALINIT ALCRONA PRO," said Dr Wolfgang Kalss, Head of Marketing and Product Management Tools.

For good reason: with coatings such as these, cutting speeds go up – and costs go down. An example calculation based on test with the new BALINIT ALTENSA coating demonstrates this: if the speed of gear cutting can be increased from 200 to 300 m/min, machining time (primary and secondary times) goes down from 0.56 to 0.42 minutes per gear. This reduces machining costs by about 25 percent, based on the machine-hour rate. If one considers the overall costs of producing a gear, this represents a cost saving of about 10 percent. It thus pays to invest in new substrate materials or coatings.

Improved conductance and hot hardness

BALINIT ALTENSA is the newest product from Oerlikon Balzers successful AlCrN-family to excel, above all, in terms of wear resistance, thermal shock stability and hot hardness. In light of market demand for ever increasing processing speeds, coating properties were specifically

further optimized for high temperatures. "In essence we further reduced thermal conductance and improved the hot hardness of the coating by a good 20 percent," explained Wolfgang Kalss. This produced even greater crater wear resistance, which can, in particular, occur at high service temperatures and reduce tool service lifetime.

Abrasive wear resistance was, moreover, optimized by about 35 percent, as was oxidation resistance. This reduces flank wear at moderate and high cutting speeds and extends tool service life, even with dry machining.

The bottom line is that the numerous improvements in layer development enable considerable productivity gains with longer tool lifetimes, significant performance boosts at the highest cutting speeds for all substrates (PM-HSS, MC90, carbide), as well as higher cutting speeds and feeds.

More performance, reduced costs

Renowned European vehicle manufacturers and suppliers have tested BALINIT ALTENSA in different applications – PM HSS hobs and carbide hobs, carbide stick blades and HSS shaper cutters. The result: not only up to 50 percent higher cutting speeds, but also significantly higher tool service life, with both wet and dry machining. "This shows that BALINIT ALTENSA sets new performance standards for gear cutting and makes it possible to achieve previously unknown tool service lifetimes, as well as a significantly improved level of process reliability at higher cutting speeds. For the user this means: more performance and reduced manufacturing costs," summed up Wolfgang Kalss. ●



METAPLAS.DOMINO

Impress the market with flexibility

For one: an especially flexible system. For others: access to the Oerlikon Balzers global sales and after-sales network. Both previous Metaplas customers, and Balzers customers, for whom an own system previously barely made economic sense, profit from the inclusion of METAPLAS.DOMINO in the Oerlikon Balzers system portfolio.

Modular construction, combinable for individual requirements, variably united to form a whole – this is the foundation of the METAPLAS.DOMINO. The system can be perfectly configured for the needs of each individual customer.

Equipped for today and for the future

“METAPLAS.DOMINO is a system series that allows both small and medium sized companies to take charge of their coating work. With it we offer a new technology platform to customers for whom ownership of their own system formerly didn't make economic sense. This enables them to develop suitable coating solutions for present and future challenges by themselves. At the same time, former Metaplas customers also profit from the integration of the METAPLAS.DOMINO product line into Oerlikon Balzers, as it provides them with access to our global sales and after sales network,” stated Volker von der Heide, Head of Equipment Sales, Product line Metaplas, at Oerlikon Balzers.

New trends for high performance coatings

The most important modules offered by Oerlikon Balzers for this product line are APA Arc, sputtering, DLC, Combi and HIPAC (high ionisation plasma assisted coating). In the past, a combination of the arc and sputtering processes provided no notable advantages because of their dissimilar characteristics. With the development of the HIPAC module, it is now possible to combine three high ionization processes on an industrial scale to create innovative HI3 (High Ionization Triple) technology : AEGD (plasma etch process for excellent coating adhesion), HIPAC (high ionization sputtering process) and APA-Arc (high ionization arc-process).

For the first time, process and material combinations can be used that allow totally new development trends for high-performance coating. The combination of high ionization sputtering and arc processes allows the use of coating architectures previously not economically realizable in a production context. ●



Porsche Spyder: Driving performance

Coating
technology
heightens engine
capabilities



The Porsche 918 Spyder is an environmentally-friendly hybrid vehicle, and simultaneously a powerful sports car. One of the secrets of its enormous power: a thin coating on the cylinder walls which reduces motor friction.

by Erik Sherman



Riding in a Porsche 918 Spyder is the closest you might get to the experience of piloting a fighter jet. Sitting deep inside the car's carbon fibre body, acceleration from the 887 horsepower (hp) system presses you back as the 918 jumps from 0 to 100 km per hour in just over 2.6 seconds. Less than five more seconds and the speed hits 200 km per hour. By the time you realize you lost your breath, it is hundreds of meters behind.

High performance, low consumption

This raw powerhouse has already claimed at least one track record and yet remarkably is not actually a race car. Porsche designed the 918 for everyday utility and performance. Steerable front and rear axles improve stability and handling. Adjustable driving modes keep the car ready for anything from comfortable transportation to race-ready.

And yet, remarkably, the car uses a hybrid drive system, with a traditional V-8 engine that offers a maximum 608 horsepower power output and two electric motors that, between them, add another 285 hp, hence an im-

pressive total output of 893 hp. Hybrids that combine internal combustion engines with electric power have become increasingly popular around the world for their eco-friendliness with the ability to increase mileage, which reduces carbon emissions and decreases the cost of operation. With all the performance the 918 offers, the hybrid construction allows it to travel 100 kilometres on only 3.0 litres to 3.1 litres of petrol. "Porsche has an obligation not only to provide our customers with the most thrilling automotive experience possible, but to find solutions that can increase the environmental friendliness of even our highest performance vehicles," said Dr Frank-Steffen Walliser, Vice President of Motorsport at Porsche AG.

The car is a miracle of refined design, intricate engineering and demanding production. But Porsche had an advantage that is invisible to the eye. The company used a special coating inside an innovative engine that weighs less and consumes less fuel. The material helps reduce friction and improve performance.

Most internal combustion engines are designed around a system of cylinders and pistons. Vaporized



fuel and air are mixed and introduced into the cylinders, where they are ignited. The controlled explosion pushes the cylinder down, both allowing the gas to escape and pushing a linkage to the drive shaft so the vehicle's wheels will turn.

The coating makes the difference

The coating must be applied inside the 918's eight cylinders. The process takes on a new order of difficulty because cylinders are precision machined into an aluminium engine block. After application, the coating is machined by honing to ensure the correct diameter, degree of roundness, and surface roughness needed by the cylinders. The coating must also bind permanently to the cylinder walls. "We wanted to choose an available coating approved in mass production with minimal friction," said Walter Buck, Porsche's project leader for the 918 powertrain.

The use of cylinder coatings in vehicles is well established. For example, Oerlikon Metco, which was a technology partner for the special project team created to make Porsche 918 Spyder a reality, has developed such cylinder bore coating technologies for 20 years. Automobile and truck manufacturers in Europe, Japan and in the US rely on the products and systems.

Basic to the technology is a plasma depositing process called an atmospheric plasma spray, or APS. The plasma heats the coating powder materials above the melting point and turns them into a molten stream that can then be deposited through special spray equipment onto the interior surface of the cylinders. The process does not require the use of volatile chemicals as a carrier, and so is more eco-friendly than other coating technologies. "The APS process offers the maximum variability in the coating composition and is best suited to optimally satisfy the engine specific challenges," Buck said.

"Depending on the engine type, manufacturers have various things they're looking for," said Dr Peter Ernst, Head of SUMEBore technology at Oerlikon Metco. "Most are looking for low friction that will help them reduce emissions. Some of our customers have a corrosion problem, depending on fuel quality and the way the engine is run, especially in the trucking business. Some manufacturers want to increase the longevity of their engines by reducing the wear. It depends on the customer and the application what they are looking for."

Deciding on exactly what coating to use is not necessarily easy. Different engines will vary in the metallurgical composition of their engine blocks and cylinders and the way the coatings can interact with the system's operation. Porsche worked with Oerlikon Metco for nearly five years, trying different variations and testing the results to find a balance between pushing performance and yet helping the engine to run 100,000 to 200,000 kilometres without a problem.

Porsche eventually decided on an Oerlikon Metco coating called Metco F4301. The specific composition of F4301 with high amount of molybdenum improves the coatings resistance to wear and scuffing and reduces the friction. Although molybdenum is often an alloy component in steel, here pure molybdenum is present as 'islands' to create the unique properties Porsche is looking for.

High-end technology for the mass markets

But for all the technical details, at the end it is important to focus on what they enable. The research and development that helps allow a jet-like ride in one of the fastest cars on earth eventually find their way into mass market applications, or as improved engine longevity in a truck or reduction of emissions in a common passenger car. This is just another way that microscopically thin coatings make life better for everyone. ●

"Porsche doesn't just want to offer an exciting driver experience, but also to make even the highest performance vehicles more eco-friendly."

Dr Frank-Steffen Walliser, Vice President of Motorsport at Porsche AG

Customer centre in Guelph, Canada

First joint factory



The new customer centre in Guelph, Canada (above left), the team in Guelph (above right).

Opening ceremony (below, from left to right): Peter Van Den Diepstraten, Centre Manager; Mayor Cam Guthrie; Dr Roland Herb, CEO of the Surface Solutions Segment; Steve Crowley, President Oerlikon Balzers North America.

Increased customer proximity, more efficient support and the amalgamation of two skill sets – the opening of a new factory in Guelph, close to Toronto, Canada, strengthens the presence of the Surface Solutions Segment in the Canadian market. Customers profit from a comprehensive range of surface solutions for the automotive and aerospace industries.

The service centre shall offer thin film coating (PVD), including nitriding and regrinding, and thereby provide a complete solution for tool reconditioning. Additionally, it will offer the complete portfolio of thermal spray services.

The new location brings together the competencies of Oerlikon Balzers and Oerlikon Metco for the first time. “Offering both thin film and thermal spray coating technologies makes us a unique supplier in the Surface Solutions market,” stated Dr Roland Herb, Surface Solutions Segment CEO.

For Oerlikon Balzers and Oerlikon Metco, Guelph is a dynamic business base, logistically well located for several strategic global customers in the surrounding area. “We are well positioned close to our customer base and can take advantage of the technology we need to keep us competitive in the cutting tool, mould and die markets,” stated Steve Crowley, Production and Sales Manager North America. ●

Automotive market offensive

Opening of the first European Competence Centre

In September, Oerlikon Balzers opened its first European Competence Centre for coatings for the automotive industry, with a grand opening ceremony and in the presence of Prime Minister, Dr Robert Fico. The new Slovakian plant is a part of Oerlikon Balzer's comprehensive overall strategy for the constantly growing automotive market.

Oerlikon Balzers has been a successful player in this market segment since 1998, and renowned vehicle manufacturers and their suppliers all over the world rely on Oerlikon Balzers' surface solutions. The site in Velká Ida, close to the major Slovakian city of Košice, bundles the company's service offering for the German and European automotive industry in a central location. Crucial for the selection of Velká Ida as location were the well-developed industrial zone, a high skilled labour potential, advantageous transport connections and local education opportunities, enabling the recruitment of sufficient engineers.

State-of-the-art production location

Production started there in September 2015. With a total of 100 jobs planned, Velká Ida is positioned to be Oerlikon Balzer's largest and most up-to-date production location. The site uses highly innovative coating systems, fully automated test systems, batch loaders for components, and state-of-the-art stripping technology for the maintenance of fixtures and system components. It also has an IT-supported, high-bay warehouse for unprocessed parts and finished products.

The new plant optimally equips the company to deal with the future challenges of automotive coatings. Whether the engine or power train, oil pumps or brakes, headlights, body or interior – virtually no part of a modern motor vehicle is produced or operates without a coating solution from Oerlikon Balzers. Without coating, some engine components would last just about one day – with



CEO Dr Roland Herb and the Slovakian Prime Minister Robert Fico at the ceremonial opening event.

Oerlikon Balzers coating solutions, however, they last for the lifetime of the car!

The decisive challenges for automotive coatings include friction, wear, and the absolute precision demanded by manufacturers. Less friction means greater performance and reduced emissions; less wear means greater loads and longer component service lives with improved safety and reliability; and fulfilling strict tolerance requirements means greater efficiency.

Further expansion

As well as Velká Ida, whose further expansion is planned for the following year, Oerlikon Balzers is working on two further automotive competence centres in the USA and China. ●

Tomorrow's specialists



Great apprentices: Francesco Macri successfully participated in the 'World Skills' vocational championship in Sao Paulo (Brasil).

Almost 100 young people are currently serving apprenticeships at Oerlikon Balzers or Oerlikon Metco in Liechtenstein, Switzerland, Germany and Austria. The quality and continuous development of apprenticeship training is a major concern for the company, and will continue to contribute to the provision of skilled workers in the future.

The demands of the economy and the markets are constantly changing. The vocational training strategy pursued by Oerlikon Balzers and Oerlikon Metco is correspondingly ambitious. Around 100 young people, most of them at Oerlikon Balzers' vocational training centre in Liechtenstein, are currently enrolled in a broad range of apprenticeships to become polymechanics, electronics engineers, physics laboratory technicians, automation engineers, materials testers and surface coaters, but also media technologists and information scientists. During summer 2015, the 1,400th apprentice successfully finished his training at Surface Solutions.

Committed and talented

80 trainees are currently preparing themselves for their future careers in a total of nine professions, with a three or four year apprenticeship at Oerlikon Balzers' training centre at Balzers' headquarters. Founded back in 1946, the centre is one of the region's most important vocational training establishments. The training it provides is

precisely tailored to the needs of the company. The apprentices are fully deployed in the company during their 3rd apprenticeship year at the latest. "Gaining committed and talented trainees for an apprenticeship is therefore especially important," says Albert Hehli, vocational training manager at Balzers.

Fit for the future

Some of the young specialists remain with Surface Solutions after completing their apprenticeships. All are sought after by the market and fit for the needs of the economy. "Most of our graduates receive at least one, and sometimes multiple job offers before they even finish their training," Albert Hehli states with pride about the Surface Solutions vocational training programme. At Oerlikon Balzers alone around 10 percent of the workforce is made up of former apprentices – some of whom are managers today. 10 graduate apprentices were also hired directly in the summer of 2015.

'WorldSkills'

The especially high standard of training is another major reason why it provides a bright future. Trainees don't just acquire the skills needed for their later professions, but are also supported – and challenged – in many diverse ways. That this strategy pays off is shown by the fact that during the 70 years of Surface Solutions training 20 apprentices have participated very successfully in the 'World Skills' vocational world championship that is held every second year – the latest being former design engineering apprentice Francesco Macri who participated in August 2015 in Sao Paulo (Brasil). ●

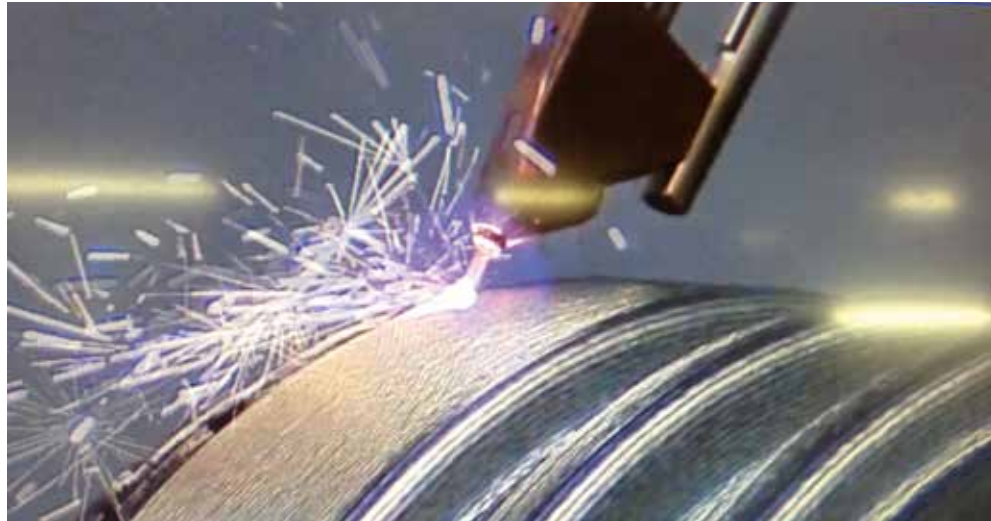
News & Events

Expansion of the technology portfolio

With the acquisition of the business of Laser Cladding Services, LLC., Oerlikon Metco enhances its existing laser cladding offering and broadens its service portfolio.

The company, based in Houston, USA, is specialized in laser cladding applications for the energy industry. The acquisition extends and improves Oerlikon Metco's service offering in laser cladding and opens up access to key customers in the US energy sector.

Laser cladding is a state-of-the-art surface technology using a laser beam to deposit materials and layers onto a substrate or to fabricate near-



net shape parts. It makes it possible to coat thin-walled components and also thinner layers can be applied than with PTA or traditional weld overlay. These advantages make laser cladding particularly suitable for applications in demanding are-

as where a high degree of accuracy and performance is needed, such as with turbine blades, drilling equipment and pump components in the energy sector. ●

Will we be seeing each other soon?

2016 Trade Show dates

Oerlikon Balzers and Oerlikon Metco will this year again be represented at the important Surface Solutions trade shows. We look forward to your visit.

- 13.4.–17.4. SIMTOS** Seoul International Manufacturing Technology Show. Seoul, South Korea
- 25.4.–29.4. ICMCTF** International Conference on Metallurgical Coatings and Thin Films. San Diego, USA
- 2.5.–5.5. OTC** Offshore Technology Conference. Houston, USA
- 10.5.–12.5. ITCS** International Thermal Spray Conference. Shanghai, China
- 25.5.–27.5. Automotive Engineering** Exposition. Yokohama, Japan
- 31.5.–2.6. Automotive Interiors** Exposition. Stuttgart, Germany
- 11.7.–15.7. Farnborough** International Airshow. Farnborough, United Kingdom

- 11.9.–15.9. EUROCORR** European Corrosion Congress. Montpellier, France
- 12.9.–17.9. IMTS** International Manufacturing Technology Show. Chicago, USA
- 13.9.–17.9. AMB** Internationale Ausstellung für Metallbearbeitung. Stuttgart, Germany
- 7.11.–10.11. ADIPEC** Abu Dhabi International Petroleum Exhibition & Conference. Abu Dhabi, UAE
- 16.11.–18.11. FABTECH** Metal Forming, Fabricating, Welding and Finishing Event. Las Vegas, USA
- 17.11.–22.11. JIMTOF** Japan International Machine Tool Fair. Tokyo, Japan



No one is closer to their customers. **Worldwide.**

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more than **55** centres in **Europe**

more than **40** centres in **Asia** and Australia

Oerlikon Surface Solutions

Iramali 18
LI-9496 Balzers, Liechtenstein
T +423 388 7500
www.oerlikon.com/surface-solutions

Oerlikon Balzers

Iramali 18
LI-9496 Balzers,
Liechtenstein
T +423 388 7500
www.oerlikon.com/balzers

Oerlikon Metco

Zürcherstrasse 14
CH-8401 Winterthur,
Switzerland
T +41 58 274 20 00
www.oerlikon.com/metco

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