Materials for tomorrow

Enhanced performance through advanced materials, surface engineering and polymer processing
Attractive markets

Every day, we are getting smarter in how we use resources. We demand that the objects that surround us, the cars we drive, the airplanes we fly, even the clothes we wear, perform better and help us achieve more with less. What makes this possible are new and better materials, and new ways to shape them and give them purpose.

Unique competences

This is what Oerlikon does. We engineer and process materials and surfaces to give products improved and more desirable functions. We help cars and airplanes use less fuel, make tools last longer, and improve the manufacture of textiles. Our technologies enable manufacturers to do things they simply could not do before and advance industrial innovation.

Forward-looking strategy

Oerlikon is a market leader in advanced materials, surface engineering and polymer processing. Our solutions encompass materials, coating equipment, coating services, and the engineering of entire plants. We build our business on unique technology competences, the widest global reach and trusted customer relations in highly demanding industries such as aerospace, automotive, energy, tooling and textiles. Every day, we develop on new materials, new surface technologies, new applications, components and textile manufacturing solutions to empower our customers to create and innovate better products.

Increased customer value

- More profitable
- More efficient
- More sustainable
- More durable
- More productive
Positioned in long-term growth markets

Oerlikon focuses its activities on strategic growth markets with long-term potential. Thanks to innovative solutions with forward-thinking technologies, Oerlikon’s customers generate measurable added value in these markets.

Markets we serve:

- Aerospace
- Automotive
- Energy
- Tooling industry
- General industries
- Manmade fibers

**Oerlikon Balzers**

Oerlikon Balzers is one of the world's leading suppliers of surface technologies that significantly improve the performance and durability of precision components and tools for the metal- and plastics-processing industries.

It offers leading thin-film and nitriding coating expertise to more than 30,000 customers throughout all industries.

**Oerlikon Metco**

Oerlikon Metco is a market leader in advanced materials, thick-layer surface technologies and turbine component solutions.

It is one of the largest players in thermal spray materials and equipment with a firmly anchored position in the aerospace, power generation, automotive and industrial markets.
Oerlikon is the worldwide market and technology leader for complete plants for the production of BCF carpet yarns and synthetic staple fibers.

Furthermore, Oerlikon is also a leading solution provider of a wide range of nonwoven technologies — with spunbond, meltblown and airlaid solutions, Oerlikon covers the technical and disposable nonwoven markets.

Oerlikon am

Oerlikon is an integrated service provider of industrial Additive Manufacturing (AM) solutions.

It provides advanced metal powders for AM processes, application engineering expertise as well as one of the largest AM production and post-processing capacity in the US and EU. Oerlikon’s full spectrum AM capability allows it to engage customers who require a partner to handle their AM project prototype to series production.

Oerlikon Barmag is the world market leader in the development and production of spinning and texturing systems and equipment for manmade fibers such as polyester, nylon and polypropylene.

Oerlikon Barmag’s engineering services include Industry 4.0 solutions from the monomers all the way through to textured yarns and far beyond.

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PVD Coatings of pump and valve components in fuel and hydraulic systems reduce friction, protect against wear to increase component lifetime.

EBC (Environmental Barrier Coatings) for turbine components manufactured from SiC-based CMCs (Ceramic Matrix Composites) ensure excellent thermal expansion and provide protection against vapor and other environmental attacks. Hard erosion- and corrosion-resistant coatings for compressors are 40× more resistant than steel.

Turbine components such as airfoils, honeycomb seals and compressor vane assemblies ensure enhanced sealing and cooling of the turbine and improve engine efficiency.

Maximum protection
Making aerospace safer, more powerful and more efficient

All major aero engine manufacturers today use Oerlikon advanced materials, functional coatings or process technologies to boost performance, improve safety and fuel efficiency, and control emissions.

**5 %**

Thermal spray abradable coatings applied as clearance control solutions increase engine safety and boost efficiency by up to 5 %.

TBCs (Thermal Barrier Coatings) provide outstanding thermal protection for turbine engines and enable higher combustion temperatures permitting better fuel and engine efficiency.

PVD Coatings protect compressor blades against erosion and corrosion resulting in improved fuel efficiency and part durability.
A coating that would work inside a live volcano …

The interior of a jet engine can exceed 2000 °C — hotter than molten lava. To protect the engine’s turbine blades in such extreme operating temperatures, we developed a special thermal barrier coating. The coating is up to 250 µm thick and ensures a longer life cycle, improved performance and increased safety.

… making turbines more effective

Our materials, coatings and turbine components increase the efficiency of the aero engine and protect a wide range of operational-critical parts, including clearance control systems, air seal components, compressor blades, vanes, impellers and IBRs (Integrally Bladed Rotors). By preventing problems caused by fretting, abrasion, particle erosion and other surface mechanisms, the coatings maximize turbine efficiency, optimize design point performance and improve thermal efficiency.

<table>
<thead>
<tr>
<th>Aerospace coating applications</th>
<th>Engine mount parts</th>
<th>Engine mount parts</th>
<th>Engine mount parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan blades</td>
<td>Hydraulics systems and fuel pumps</td>
<td>Actuators</td>
<td>Actuators</td>
</tr>
<tr>
<td>Compressor blades, vanes and seals</td>
<td>Actuators</td>
<td>Airframe parts</td>
<td>Airframe parts</td>
</tr>
<tr>
<td>Turbine blades and seals</td>
<td></td>
<td>Tools for engine/airframe processing</td>
<td>Tools for engine/airframe processing</td>
</tr>
<tr>
<td>Combustion chambers</td>
<td></td>
<td>Tools for structure development</td>
<td>Tools for structure development</td>
</tr>
<tr>
<td>Rotor path linings</td>
<td></td>
<td>Cockpit instruments</td>
<td>Cockpit instruments</td>
</tr>
<tr>
<td>Engine pylons</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landing gears</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Enabling aircraft operators to save millions of liters of fuel every day

Aerospace is one of the fastest-growing markets worldwide. In the last five years, passenger volume increased by a third — far faster than the International Air Transport Association’s (IATA) estimate. Today, 3.8 billion passengers fly each year. That’s the equivalent of over half the earth’s population. And still, demand accelerates. In response, aerospace companies are developing next-generation airplanes. At the same time, they must increase efficiency and sustainability.

To successfully address both challenges, some components — the jet engine, for example — need to change. They must become both lighter and more resilient to higher operating temperatures, fretting, sliding wear and corrosion. Engines and many other critical components have to be developed further in order to reduce fuel consumption, and CO$_2$, NO$_x$ and CH$_4$ emissions. But manufacturers cannot achieve these goals alone.

Oerlikon provides significant added value with vital expertise in advanced materials and process technologies. We create new materials and coatings to improve performance across the aerospace industry. Additionally, we develop new textiles to ensure passenger safety. Many aircraft are already benefiting. For example, our coatings protect turbine components and combustors from extreme temperatures to achieve class-leading gains in operating efficiency. As a result, all next-generation aircraft engines make extensive use of these coatings.

Compressor and turbine

Increased safety and efficiency with fewer emissions

Abradable coatings are used in engines to seal the gas path and improve performance and efficiency of aero engines.

They are a key component in engine operation safety and allow engines to operate using less fuel (1 % to 3 % efficiency gain) and as a result have a positive environmental benefit of reduced CO$_2$ generation and NO$_x$ emissions. Oerlikon is the leader in abradable coatings. PVD coatings protect compressor blades against erosion and corrosion.

Engine hot section

Efficiency and lifetime increase at higher temperatures

Thermal barrier coatings, including environmental barrier coatings and those resistant to CMAS, are used in the hot sections of engines (combustor and turbine sections) to allow the engine components to operate at higher temperatures, resulting in improved efficiency. These coatings protect the underlying materials from temperatures that the substrates could not otherwise tolerate.

Landing gear

Safe and reliable landing gears

In the past, landing gears were hard chromium plated. Now, they can be coated with Oerlikon’s HVOF (High Velocity Oxygen Fuel) thermal spray technology.

HVOF coatings exceed the performance of hard chromium plating and meet the demanding requirements of the new generation of aircraft while replacing the noxious hard chromium process.

Aircraft interior

Attractive protection and color coding

In every aircraft, a pilot needs to see the different screens in the cockpit in order to determine the altitude, speed and attitude.

Pilots are under constant pressure to fly and land safely. Therefore, cabin fixtures should not be reflective or the pilot may miss vital data. That’s why Oerlikon developed the BALTONE coating solutions.
Coatings applied to cylinder bores result in low friction, low oil and fuel consumption, reduced wear and increased corrosion resistance.

Coated piston pins and injector nozzles in turbochargers withstand the higher pressure and temperatures needed to improve performance while curbing emissions.

Coatings for steering and suspension components guarantee increased surface hardness, wear and corrosion protection, and a longer lifespan.
Advancing productivity, sustainability and profitability in the automotive industry

Over half of the world’s largest car manufacturers trust Oerlikon advanced materials, functional coatings or process technologies to improve component durability and engine efficiency.

**Environmentally friendly**

ePD coated (embedded PVD) parts are recyclable and employ an environmentally friendly metallization technique. No harmful agents such as hexavalent chromium or other heavy metals are used in the process. It enables plastic parts to be coated with metallic effects in automobiles as important interior and exterior design elements.

**40 %**

Up to 40 % friction reduction through wear and corrosion-preventive surface solutions.

**Reduced emissions**

Brake disc coatings protect against wear and corrosion, reduce brake dust emissions and increase disc lifetime.
Lighter, slicker, more effective

We produce advanced coatings for over 100 car parts that reduce corrosion, friction and wear. The resulting fuel efficiency and improved durability of light metals means manufacturers can build smaller engines. When manufacturers adopt a comprehensive approach to component coating, they can cut fuel consumption by 2% to 4%, reduce oil consumption by 30%, and cut engine block weight by 12%.

Over 100 components per car

In today’s cars, over 100 components are coated and up to 30 kg of textiles are used.

Typical applications in the automotive sector

- Production tools
- Engines
- Valves
- Fuel injectors
- Exhaust systems
- Transmissions
- Gears
- Suspension
- ESP/brake system
- Turbochargers
- Decorative elements
- Safety belts
- Interior elements
- Moldings
- Exterior decoration
- Tires
Driving automotive improvements by reducing weight, fuel and emissions

The automotive industry is on the rise. “In 2015, 1.0 billion cars were on the road. Driven by the increasing global demand for mobility, that number will grow to over 2.4 billion by 2050.”*

Vehicle manufacturers are faced with growing demands from regulators, customers and investors to increase manufacturing productivity, boost vehicle operating efficiency and reduce their environmental impact. To reduce fuel consumption, cars need to lose weight and gain engine efficiency. Yet safety concerns call for increased robustness and more onboard technology. Vehicle manufacturers are looking for new and innovative ways to address these challenges.

New and advanced materials, improved performance of components or new ways of manufacturing components are all part of the solution.

Oerlikon’s innovative powertrain concepts reduce energy loss from the engine to the wheels. Our specialized coatings improve wear resistance and the life of key components. Advanced materials make designs more compact, reduce weight or friction losses in the engine, and make new design solutions possible. And our manmade fiber solutions improve passenger safety and comfort — from airbags and safety belts to seats and tires.

Improved engine reliability and performance
Injectors, valves, oil pumps, exhaust systems, cooling systems, turbochargers: Every part of an engine has to perform perfectly and reliably. Oerlikon coating technologies improve the performance and durability of engine components. The coatings significantly reduce friction and wear resulting in improved fuel and oil efficiency, lower emissions and longer component lifespan.

Smoother-shifting transmissions
From cars to trucks to construction vehicles, Oerlikon offers comprehensive synchronizer and friction reduction technologies for modern transmission systems. Benefits include increased performance, excellent oil compatibility, enhanced comfort, extended life cycle, lower weight, improved wear resistance and reduced costs.

Innovative, chrome look design parts
Now, door handles, mirrors, push buttons, switch covers, gear shifters, frames and many more parts can look like chrome without the unsustainable chromium-plating process. Oerlikon’s PVD and ePD technologies offer environmentally friendly, chrome look plastic metallization. Manufacturers can offer their customers the aesthetics they want and please regulators and nature at the same time.

Further improving passenger safety
Brake discs, safety belts, airbags and tires are all key to vehicle and passenger safety. The reliability and quality of the materials used are essential if every single part has to work to perfection every time. Oerlikon technologies such as brake disc coatings and manmade fiber solutions equip manufacturers with technologies that further increase vehicle safety.

* International Transportation Forum (ITF)
Corrosion- and erosion-protective coatings applied to hydropower turbine components extend service life, increase turbine efficiency and decrease maintenance costs.

Coatings protect gas turbine components from oxidation, hot-gas corrosion, erosion and wear. Combined with specialized turbine components, they maximize operational efficiency and reliability with less environmental impact.

Surface solutions increase wear resistance, improve component performance and extend the time between maintenance cycles of gears, roller bearings, hydraulics and structural parts required for reliable wind power.
Enabling the way to effectively generate energy

The world’s largest producers of power generation equipment build on Oerlikon advanced materials, functional coatings or process technologies to improve performance and cut the environmental impact of energy generation systems.

Tailored materials and coatings protect ball valves used in the oil and gas industry from galling, abrasion and erosion resulting in smooth, reliable operation and preventing unintentional valve backflow or leakage.

Abradable sealing coatings for steam turbines result in increased power output and efficiency, while reducing fuel consumption which lowers CO₂ emissions.

Coatings protect centrifugal injection pumps used for hydraulic applications from abrasion, erosion and corrosion and extend the pump time to failure by a factor of over three.
Hydro turbines

Hydropower is the primary renewable energy source used to generate electricity. Corrosion and erosion cause efficiency losses that are worsened by the amount of entrained silt, sand and gravel in the water. Oerlikon materials and coating technologies for hydropower turbine components reduce material erosion by a factor of up to 50 and increase the service life of components three to five times compared to uncoated components.

Wind turbines

Wind power installations have to work in sun, rain, snow and wind. Those located offshore must also contend with salt, which poses a constant threat of corrosion. A standstill incurs enormous costs. So our dedicated materials and surface solutions guard against wear, corrosion and fatigue. One example is transmission gears, which are subjected to up to 144 million revolutions of the rotor shaft, or 15 billion revolutions of the generator shaft, during their service life.

Gas and steam turbines

Parts in the turbofan, compressor, combustor, turbine and exhaust section all benefit from Oerlikon technologies: everything from blades, vanes and shrouds to shafts, disks, bearings and nozzles. For example, PVD-coated compressor blades last twice as long as uncoated versions. Abradable coatings for clearance control increase efficiency by up to 5 %. Thermal barrier coatings protect against heat. And Oerlikon-manufactured turbine components enhance sealing and cooling.

Oil and gas

Some of the harshest stresses and strains are found in the world of oil and gas exploration: abrasive wear, erosion, corrosion, fatigue, high fluid pressure, vibrations, impact loads, extreme torque and many more. To protect vital components, Oerlikon developed tailored materials combined with thin-film and thick-layer surface solutions. These advanced coatings extend the lifetime of downhole tools, pump parts, valves, drill bits, stabilizers, artificial lift components and mud rotors by up to ten times and reduce malfunctions and downtime.
Increasing power plant productivity to cover the ever-rising demand for energy

Energy. Every day you use it, consciously or unconsciously. When you watch TV. When you work on your computer. When you charge your phone. By 2030, global primary energy consumption is expected to rise by up to 40%. Propelled by this growth, the energy sector will continue to expand.

The spiralling demand for energy and the threat of climate change, combined with decreasing costs of renewable energy sources, are transforming the energy sector. Energy companies are racing to meet demand, but also to improve the efficiency of non-renewable technologies like oil and gas and to promote renewable energy technologies like solar and wind turbines.

Typical applications for the energy sector

<table>
<thead>
<tr>
<th>Gas and steam turbines</th>
<th>Hydro turbines</th>
<th>Wind turbines</th>
<th>Oil and gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blades, vanes, combustion chambers, connecting studs, seal segments</td>
<td>Blades, vanes, sleeves, bearings, wheels, cranks, pins, needle spears, nozzle tips</td>
<td>Planetary gear elements, roller bearings, ring gears, shafts, pylons, blades</td>
<td>Drill collars, mud motor rotors, drill stabilizers, tricone bits, ball and gate valves, riser tensioners, mandrels</td>
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</table>
Tools coated with Oerlikon technology operate at 30% higher cutting speeds for the production of gearboxes than standard coatings, resulting in shorter machining time and reduced manufacturing costs.

Coated punch and die tools to produce safety belt latches have an extended lifetime of up to 50 times longer and provide perceptibly better surface and cut quality than non-coated tools.

Tools, such as drills, can be reconditioned up to three times, leading to a 50% cost saving for new tool purchases.
Providing sharper, stronger and more durable tools

Many of the world’s leading tool manufacturers apply Oerlikon’s surface solutions to improve tool strength, service life, lower manufacturing costs and enhance corrosion protection.

Coated tools allow more than 350 holes to be drilled with the same tool compared to only 60 holes with uncoated tools. This leads to higher efficiency in the production process.

Chemical stability

Chemical stability coatings protect cutting tools from corrosion by chemical/electromechanical reaction between a metal and a substance with which it comes into contact.

Coated threaded cores for the production of bottle caps lead to trouble-free production and productivity gains of up to 20%.
Improving the performance from the smallest precision tools to largest tools for metal die casting

Efficient, reliable tools are at the core of all industrial production. And more are needed with every passing day. When vehicle manufacturers produce cars, aircraft manufacturers fabricate airplanes or construction engineers build new energy systems, they all depend on manufacturing tools to perform effectively. In fact, tool performance is primarily responsible for the quality, cost and overall factory output of any product.

For optimum performance and service life, modern machine tools need to withstand higher temperatures and pressures, as well as increased wear and friction.

Coatings and heat treatments are among the most effective ways to improve tool performance. This in turn leads to greater productivity and quality of metalworking and plastics processing.

In close partnership with our toolmaking customers, we are developing the right solutions for every tool in the manufacturing process. The results are impressive: longer service life, lower manufacturing costs, higher production reliability, and enhanced corrosion and adhesion protection.

<table>
<thead>
<tr>
<th>Over 20 % increase in cutting performance</th>
<th>Up to 30 % productivity gain in plastics processing</th>
<th>Tenfold extension of lifetime of forming tools</th>
<th>100 % performance with up to 70 % cost savings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Challenges</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cutting tools in particular must provide high precision, fast cutting rates, long lifetimes and low production costs. Whether turning, milling, drilling, reaming, threading or gear cutting, tools are exposed to extremely high temperatures.</td>
<td>In plastics processing, such as injection molding and extrusion forming, tools play a key role for productivity and process reliability. In particular, the mold surface plays a crucial role. The better the tool quality, the greater the productivity and efficiency of the manufacturing process.</td>
<td>When forming stainless steel, untreated tools quickly approach their limits. In production, punching, stamping and forming, tools are exposed to extreme forces and subject to wear.</td>
<td>Challenges in die casting production processes are tolerance and production cycle times. An essential factor for the success of metal die casting is the quality of the mold surface. It must withstand high temperatures, erosion, oxidation and other harmful effects.</td>
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<tr>
<td><strong>Solutions</strong></td>
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<tr>
<td>Specialized coatings with low friction coefficients and a low tendency to adhere facilitate the machining of difficult materials such as titanium, stainless and Inconel alloys, as well as high-strength steels.</td>
<td>Coated forming tools provide excellent protection against corrosion and reduce friction and wear. Oerlikon, as the technology leader in hard coatings, provides the benchmark in plastic processing. Its latest wear protection solutions push the performance of molds. The results are longer tool life, less scrap, improved part quality and lower production costs.</td>
<td>Metal-forming tools require long-lasting, high-quality, reliable and robust processes to ensure high productivity. Economic efficiency and precision are key goals of all stamping processes. Surface scoring, pickup, galling, burrs and other surface defects on the parts create rework or scrap and add to the cost. Oerlikon provides optimal protection solutions to minimize wear for punching and forming tools that can save up to 86 % of the costs.</td>
<td>An untreated mold can quickly fail, leading to high costs. To prevent this, Oerlikon developed exceptionally hard, extremely erosion- and wear-resistant coatings that prevent mold erosion, abrasion, melt-sticking and oxidation, as well as alloying and premature heat checking. The results are lower tool costs due to significantly prolonged tool service life, increased productivity and production reliability.</td>
</tr>
</tbody>
</table>
### Cutting tools:
Coatings extend tool life and tolerate higher cutting speeds and feeds, reducing machining time and costs.

- Drilling
- Milling
- Gear cutting
- Broaching
- Turning
- Reaming
- Threading
- Design

### Metal forming tools:
Tools combined with a surface treatment boost quality and productivity of metal-forming applications.

- Draw and forming steel
- Draw rings
- Roll forming
- Punches and die buttons
- Monoblock cast iron and cast steel dies
- Trimming operations
- Hot forming
- Fine blanking
- Cold and hot forging

### Plastic processing:
Coating protect forming tools against corrosion, reduce friction and wear, and increase productivity of the manufacturing process.

- Melt touching
- Nonmelt touching
- Extrusion
- Injection molding
- Blow molding

### Die casting:
Exceptionally hard, extremely erosion- and wear-resistant coatings protect molds ensuring product quality and greater productivity.

- Molds
- Cores
- Inserts
Enhancing product capabilities from hygiene to durability

Companies across all industrial sectors count on Oerlikon advanced materials and functional coatings to ensure treatment safety, food hygiene, meet regulatory compliance or improve consumer goods.

Coated medical components ensure biocompatibility of implants, increase the survival and success rates of surgical implant treatments and reduce infections.

Coatings for antennas are applied to non- or poorly conductive materials to enhance electrical conductivity.

Plasma-sprayed chromium oxide coatings on anilox rolls ensure successful laser engraving of the ink-metering cells and protect the anilox roll from the corrosive effects of the ink.
Coatings with very smooth as-sprayed finishes applied to corrugating rolls for the paper industry significantly lower post-coat machining costs and extend the useful life of the roll.

Coatings that prevent surface fatigue of roller bearings reduce mechanical stress, lead to an extended lifetime and increase the durability of components.

Implants and surgical fixtures coated with titanium or hydroxyapatite fit perfectly thanks to an improved porous structure that supports bone growth.
**Medical:** Making a patient’s life better with biocompatible and antimicrobial surfaces.

- Medical instruments
- Knee or hip implants
- Bone drills
- Dental drills
- Surgical instruments
- Dental implants
- Dental instruments
- Bone saws

**Consumer goods:** Improving design, performance, efficiency and service life of goods.

- Watches
- Washing machines
- Consumer electronics
- Pots and pans
- Eyewear
- Windows
- Shavers
- Sanitary fittings
- Automotive interiors/exteriors
- Pens and office tools

**Food and packaging:** Ensuring hygiene and safety with coated components and tools.

- Food processing
- Plastic films and foils
- Labeling
- Bottles and liquid containers
- Paper production
- Chemical processing
- Biofuels
- Water and wastewater applications

**Engineering:** Improving performance, functionality and longevity of industrial products.

- Instrument panels
- Air vents
- Batteries
- Semiconductors
- Agricultural machinery
- Construction equipment
- Diesel locomotives
- Printing presses
Empowering products to achieve better results

Uncompromising quality, extreme cleanliness, regulatory compliance and easy-to-clean components are just a few of the requirements in medicine and food processing. Away from the pressures of patient safety and food hygiene, manufacturers of household appliances, consumer electronics and sports equipment develop their products with components that are either crucial decorative elements or important for a better product service life.

In engineering, performance and durability of the components are of key importance. This applies from simple mechanical applications to high-end semiconductor engineering.

Oerlikon provides a wide range of precision and high-quality coatings with properties to protect or enhance the performance of components or entire processes. Our medical coatings help keep medical instruments clean or support postoperative healing, increasing patient quality of life. In consumer goods, coatings mean components can be smaller and lighter. Our decorative coatings deliver unbeaten wear resistance and designer finishes. In engineering, they significantly improve the performance and durability of parts.

### Consumer goods

From watches to lifestyle equipment, from vacuum cleaners to coffee machines — consumer goods need to be reliable, durable and attractive. Most household appliances, consumer goods and sports equipment use metal or plastic parts.

Coating these parts enhances and improves the performance and service life of modern consumer goods. It makes their production more efficient and it ensures that they meet the highest industry standards and latest consumer tastes thanks to superb designer finishes. Such functionality can be achieved through coatings that are either extremely hard or decorative or both.

Oerlikon’s range of medical coatings includes antimicrobial coatings to prevent infections, biocompatible coatings that support the integration of a metal implant into the bone and non-reflective coatings on surgical instruments that aid surgeons’ concentration. The coatings also include solutions that improve the quality and durability of medical devices, which often have to perform for many years.

### Medical

Fighting bacterial infections often begins before or during surgery. Coatings on medical devices provide treatment-critical functions and are a rapidly growing area.

### Food and packaging

Hygiene, productivity and reliability are critical factors in food processing and packaging. Most importantly, food must never become contaminated in the processing environment. Machines and equipment must be easy to clean and have to withstand corrosive conditions caused by, for example, fruit acids or cleaning agents.

Forming, filling and sealing food is often synchronized with packaging and labeling. These processes all demand innovative and high-performing engineering solutions. Coatings from Oerlikon help maintain hygiene, reduce wear, extend the service life and thereby significantly improve the manufacturing process. The results are safer processes and substantial cost savings.

### Engineering

Engineering applications need to perform to the highest standards, day in, day out. Whether mobile phones, Wi-Fi equipment or highly sensitive semiconductors, they are all manufactured using the latest engineering technology.

But mechanically engineered components often operate under extreme conditions such as high loads, rapid sliding speeds or poor lubrication. Coatings from Oerlikon minimize friction, wear and corrosion, and enhance the reliability, service life and performance of such components. And specialized, precisely tailored coatings for semiconductors production satisfy the stringent requirements of the industry.

### Challenges

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Allowing customized solutions, new designs and faster time to market

Major industrial companies from all over the world apply Oerlikon AM (Additive Manufacturing) services to optimize product design, accelerate innovation cycles, improve product performance and eliminate product steps.

**Aerospace**

Typical aerospace applications are complex engine parts, structural components and replacement parts. Additive Manufacturing enables the production of such parts at lower weight and significantly reduced costs.

**Automotive**

Additive Manufacturing allows our customers the design freedom to consolidate several parts into one to reduce weight and supplier count. Reducing weight allows car companies to meet new legislation targets for fuel efficiency.

**Energy**

Additive Manufacturing enables the production of highly complex fluid-flow- and corrosion-resistant components from superalloys that can operate in demanding environments. Our customers benefit from our ability to manufacture and coat these complex components.
Tooling
The use of Additive Manufacturing to produce tools and tooling components reduces lead times and costs. Additionally it improves part functionality and provides design freedom to customize products.

General industries
From prototype applications to on-demand parts, manufacture of small batches or mass customization, Additive Manufacturing allows companies from all industries to design products in a way that perfectly meet their needs.

Medical
Since every patient is unique, Additive Manufacturing opens up new possibilities for medical treatments as it allows rapid customization of medical devices such as implants, instruments and models very fast with high precision, high quality and with the biggest positive impact on health.
Cutting development times to build more complex and efficient products

From metal powder atomization to advanced component production and assembly, Oerlikon provides AM (Additive Manufacturing) services for industrial companies all over the world.

We provide focused support to solve specific customer challenges in R&D, material supply, design/engineering, testing and manufacturing of their AM products.

The result? Customers can reduce time to market, shorten their supply chains and increase the performance of their components.

We are experts in atomized metal powders. We have extensive expertise in the engineering and manufacturing of industrial components. And we know the AM challenges and needs of our customers’ industries.

<table>
<thead>
<tr>
<th>Engineering and design</th>
<th>Materials</th>
<th>Additive production</th>
<th>Post-processing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mastering functional design</strong></td>
<td><strong>Choosing the right materials</strong></td>
<td><strong>Knowing advanced manufacturing</strong></td>
<td><strong>Enhancing surface functions</strong></td>
</tr>
<tr>
<td>Manufacturers create designs using CAD to make a 3-D model of the product. To take full advantage of the design freedom AM offers, they need in-depth technical and domain-related knowledge, and expertise in materials, application design and the setting of process parameters.</td>
<td>AM industrial components primarily require the use of metal powder with a high purity and very narrow distribution of granular size. A growing number of metals are being used for industrial AM applications. The most common are aluminium, cobalt, stainless steel and titanium.</td>
<td>Printing additively manufactured products, layer by layer, by melting powder with a specialized, high-power laser requires corresponding capabilities: adequate printing equipment and know-how about building structures and programming process parameters.</td>
<td>Additively manufactured components often require post-processing to achieve the desired surface functionalities, dimensional accuracy, final mechanical characteristics and material properties.</td>
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<tr>
<td>Oerlikon has industry-leading expertise in the design and engineering of industrial components and the related process chain. We support our global customers in their needs for AM R&amp;D, design, testing and engineering.</td>
<td>Oerlikon has over 80 years experience in developing and manufacturing materials for critical industrial applications. We offer a market-leading material portfolio serving processes such as thermal spray, laser cladding, brazing, weld hardfacing and more. It spans metals and alloys, wires, carbides, ceramics and abradables, including fully AM-certified materials.</td>
<td>Oerlikon has long-standing and leading know-how in manufacturing high-performance industrial components. We are a leader in the design, development and engineering of aerospace and industrial gas turbine components.</td>
<td>Oerlikon is the technology and market leader in surface engineering (coating) and offers the full range of post-processing applications. These range from hot isostatic pressing to heat treatment, machining, surface treatment and final quality inspection, provided through an established global service network.</td>
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Aerospace project antenna bracket Sentinel satellite

**Challenge**
- Optimize antenna design for strength and weight
- Every single gram saves significant fuel cost for the ascent to space exploration

**Solution**
- Consolidated antenna into a robust single-part design
- Antenna produced by metal additive manufacturing
- Weight reduced by 40%

### Benefits of Additive Manufacturing

<table>
<thead>
<tr>
<th>Optimized design and high complexity</th>
<th>New business models</th>
</tr>
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<tbody>
<tr>
<td>AM allows development of highly complex designs in new geometries and materials</td>
<td>Parts or entire products can be built on demand, which have enormous implications for the way manufacturers design, build and sell their goods</td>
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<tr>
<th>Shorter innovation cycles</th>
<th>Faster time to market</th>
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<tr>
<td>Innovations are designed, developed and tested more rapidly, eliminating the need for expensive and time-consuming part tooling and prototype fabrication</td>
<td>AM provides a fast track from concept to production, where complex objects can be manufactured in a single process step</td>
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<th>Perfect for mass customization</th>
<th>Performance enhancement</th>
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<tbody>
<tr>
<td>Its flexibility and customization at low unit costs make AM optimal for small production batches and mass customization of components and parts</td>
<td>Additively manufactured parts can be designed with new properties, features and materials to improve performance</td>
</tr>
</tbody>
</table>
**Improved energy efficiency**
Reduction in energy consumption is becoming increasingly important for textile manufacturers. In the development of new components, machines and systems, Oerlikon is constantly optimizing the efficient utilization of the energy consumed. Thanks to Oerlikon’s knowledge, it is possible to achieve energy savings of up to 50%.

**Use of sustainable technologies and recyclable products**
Profitable, sustainable growth for all stakeholders is the goal at Oerlikon. The company is thus making its contribution to securing the future. Performance, quality, sustainability and passion are the factors that enable Oerlikon to face the challenges of the future day by day.

**Compact machine design and efficient use of space**
The influence of ergonomically designed components and machinery is often underestimated. In addition to rational considerations, ergonomic knowledge also forms the basis for space-saving machine designs with clearly structured and easy-to-grasp operating and control elements that embrace Industry 4.0 solutions.
Serving the growing need for better functional fibers and apparel

The world’s largest textile manufacturers apply Oerlikon filament spinning, texturing, BCF carpet yarn, staple fiber and nonwoven machine solutions to enhance energy efficiency, increase sustainability, and reduce production costs.

Low production costs and machine downtimes
Optimally designed equipment supports the ecological balance in many ways: Labor costs and downtimes for maintenance are dramatically reduced, and consistent quality and efficient production are ensured.

Highly reliable processes
Oerlikon engineers look back on decades of experience in the production of polyester, nylon and polypropylene. The tried-and-true technologies are used in nearly every manmade fiber production plant worldwide. With a conversion rate of more than 99%, Oerlikon guarantees reliable processes for industrial production.

High-quality output
Each year, millions of tons of polyester, nylon and polypropylene are produced on tens of thousands of Oerlikon machines, which is why the quality and the characteristics of the razor-thin filaments and yarns must always be the same — if they are not, the final fabric will eventually show the differences.
Textiles and apparel

Filament yarns are largely used for textiles and apparel. Today, polyester, nylon and polypropylene yarns are the primary materials to manufacture clothing. From the finest suits to heavy-duty applications, modern clothing is building on yarns and fibers to perform.

Functional wear

Yarns are the starting material for a wide range of fabrics — from fashion, sports and home textiles to specialty functions such as bulletproof vests and fire protection gear.

Medical and filters

Yarns are also used for a wide range of filter applications. They provide specific functions such as absorbency, liquid repellency, resilience, stretch, softness, strength, flame retardancy, washability, cushioning, thermal insulation, acoustic insulation, filtration, microbial barrier and sterility.

Packaging

Polymer processing creates a large number of potential applications for the production, handling and packaging of food and goods. From bottling to insulation to foils that protect food from external effects, yarns are designed to perform specific functions.

Infrastructure

The applications are as diverse as they are specific: from fibers for geotextiles to roofing and agricultural applications as well as windbreak netting.

Flooring and textile

Textile flooring applications, such as carpets and various home textiles in diverse shapes and colors, are manufactured with manmade fibers. Those applications need a highly resistant material. And that is exactly what Oerlikon materials can provide.

Transportation

Aerospace textiles, automotive applications such as tires, safety belts and airbags, sails, and much more are manufactured using industrial yarns.

e-save

comprehensive efficiency

By consistently expanding the e-save philosophy in the Oerlikon manmade fibers business since 2004, we are continuously making a difference through high-quality, innovative industrial solutions. Oerlikon’s innovations are developed with the following four e-save aspects in mind: energy, economics, environment and ergonomics.
High-performing yarns for every type of product

The global need for textiles from markets such as clothing, functional wear, packaging, medical, infrastructure and transportation is growing rapidly.

Apparel, functional wear, carpets, automotive tires, safety belts, airbags, geotextiles for construction, ropes, conveyor belts, sails and filters to clean water and air all rely on fibers. But natural fibers use too many resources, for example water, for their production, or cannot offer the functionality needed. Industrial yarns are the solution — they form the basis for almost all technical textiles.

Ever since manmade fibers were created, the goal has been to give the smooth, synthetic filament a natural fiber-like character and specific functions such as elasticity and increased heat retention. Oerlikon is the world market leader for systems used in the manufacture of manmade fibers. We offer technologies from Melt to Yarn, Fibers and Nonwovens. Oerlikon’s large-scale filament spinning and texturing plant solutions are designed to manufacture and process polyester, polyamide and nylon. This material can also be manufactured on high-tech production systems for carpet yarns, synthetic staple fibers and nonwovens.

From textile machines to turnkey plant engineering
Leading and widest-ranging portfolio of surface technologies, advanced materials, coating equipment and services.

Innovation: Over 1,000 engineers are dedicated to the research and development of new technologies, applications and solutions for our customers.

More than 95 years of materials, surface engineering and polymer processing expertise.
Technologies for tomorrow

We are giving freedom to innovate your products of tomorrow

In 2017, over 90 patents filed and 4% of total sales allocated in R&D.

Partner of more than 50 institutes worldwide.

42 centers dedicated to materials, surface engineering and polymer processing research & development.
Forward-thinking technologies

We are a global, high-tech engineering group dedicated to share our unique competences and technologies to enhance the performance, productivity and durability of our customers’ products and solutions. Our solutions encompass materials, equipment and services including the engineering of entire plants.

We continually expand our industry-leading portfolio with the latest technologies and solutions. Customers who already use our technologies have rapidly expanded their application range.

We build on our leading, wide-ranging technology portfolio, the widest global reach and trusted customer relations in highly demanding industries such as aerospace, automotive, energy, tooling and textiles.

We have a proven track record in innovation, quality and reliability. Our employees are committed professionals with an expert understanding of technology and industry-driven innovation.

**Surface solutions**

Number one in surface solutions: We offer the most comprehensive portfolio of surface technologies. Together with our customers, we develop tailor-made solutions for various industries from coating of components to high-precision tools.

Customers can choose from our standard portfolio, but can also order customized materials and surface solutions for their specific applications.

**Advanced materials**

Broad portfolio of advanced materials: We understand the properties of materials at the smallest scales and are a world-class materials manufacturer of powders and wires for coating applications and specialty markets.

We provide hundreds of diverse products to choose from, including the broadest line of thermal spray coating materials and auxiliary products in the world.

**Materials processing**

Unique component engineering expertise: We offer comprehensive know-how in the engineering and processing of materials and surfaces to design high-performance industrial components.

We apply our strong complementary expertise in materials, software and production of high-performing components to offer AM-based advanced component manufacturing capabilities as an end-to-end AM process for the entire value chain.

Our offering ranges from design, prototyping, individualized components and series to mass production and repair/service.
**Materials**

We offer the widest range of advanced materials for surface solutions and Additive Manufacturing production.

**Coating services**

In more than 140 dedicated customer centers, we offer coating services that are rigorously geared to customer needs — from pickup to cleaning, regrinding, re-treatment, post-treatment to polishing.

**Equipment and systems**

We provide highly productive and reliable systems for a wide range of requirements, including customer-specific on-site production lines.

**Engineering**

We offer engineering and design support for tools and components. We provide standardized and customized solutions developed in cooperation with our customers.
Serving our customers locally
<table>
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<tr>
<th>Statistic</th>
<th>Value</th>
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<tbody>
<tr>
<td>Sites globally</td>
<td>&gt;180</td>
</tr>
<tr>
<td>Number of employees worldwide</td>
<td>&gt;15000</td>
</tr>
<tr>
<td>Sales and service sites</td>
<td>&gt;180</td>
</tr>
<tr>
<td>Sales in million CHF</td>
<td>&gt;2800</td>
</tr>
<tr>
<td>Coating centers</td>
<td>&gt;140</td>
</tr>
<tr>
<td>Production and R&amp;D sites</td>
<td>55</td>
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