



THE SKY'S THE LIMIT FOR Coatings!

Surface technology specialists, Oerlikon assesses the trends and demands on the company in working within the challenging and ever-evolving aviation industry.

→ Landing gear parts are coated using HVOF thermal spray with wear resistant tungsten carbide-based coatings (above)

→ Jon Gutleber, Oerlikon's senior project manager and technical expert (below)



Advanced materials and coatings can make a real difference when it comes to an aerospace sector's requirements regarding efficiency and sustainable products. Thanks to its expertise in developing and processing surface solutions and advanced materials, Oerlikon is one of the leaders when it comes to servicing the aerospace sector.

The company's surface coating products cover the range of engine sections that start with fan blade components coated with Metco thermal spray for wear and anti-fretting protection, and progress to compressor blades coated with Balinit Turbine Pro using Balzers PVD technology for

erosion and corrosion protection.

At the heart of the turbine is the combustion and hot section where the Metco family of Thermal Barrier Coating (TBC) systems enable the pushing of operating temperatures higher to maximise fuel efficiency. These TBC systems can also be used on augmenters or 'afterburners' on the exhaust side of primarily military aircraft.

On the landing gear chassis side, landing gear components are coated using HVOF thermal spray with wear resistant tungsten carbide-based coatings which offer greater performance and are more environmentally-friendly than traditional chrome plating.

New HVOF coating architectures

which are more cost-effective, innovative new capabilities of the process for inner diameter coatings, and rising environmental regulations against chrome plating are increasing the use of HVOF coatings on landing gear components. For smaller landing gear components, such as bearings, bolts and pins, and actuator shafts, Oerlikon also offers its PVD carbon coating portfolio as REACH-compliant coatings that provide the lowest friction combined with wear protection to extend seal life.

"The capabilities and portfolio of Oerlikon encompasses multiple technologies which from the perspective of a turbine engine give the range of suitability literally from 'intake to exhaust,'" states Oerlikon's senior

project manager and technical expert for coating and materials development, Jon Gutleber.

Print and coat

Oerlikon established a world-class additive manufacturing facility in Huntersville, North Carolina in 2019. The next step is a substantial investment at this facility in 2022 to add thermal spray and blown powder laser cladding capabilities, which are core technologies of Oerlikon Metco services. By combining Oerlikon AM additive manufacturing capabilities with Oerlikon Metco coating capabilities under one roof, the company says it can now offer 'print & coat' parts. The expansion will not only be outfitted with leading coating and cladding equipment, it will also offer pre- and post-coating inspection and machining services, as well as built-to-print replacement parts manufactured on state-of-the-art CNC machinery.

"With a diverse array of capabilities in one advanced facility, collaboration and agility for new applications is on the horizon for Oerlikon customers," adds Gutleber. "Furthermore, the facility can leverage the materials and R&D capabilities of Oerlikon to provide advanced surface solutions for customer specific needs and challenges."

Oerlikon has also established a high temperature material development and coating test lab at its Oerlikon Metco US facility, equipped with advanced powder manufacturing equipment, thermal property measurement instruments, thermal cycling, burner

rig, and various state-of-the-art high temperature test rigs.

Chris Dambra, product manager for high temperature materials at Oerlikon, states that this capability will allow the company to rapidly screen and develop new material compositions, and apply new coating architectures for aero and industrial gas turbine applications.

"This lab coupled with our Rapid Alloy Development (RAD) modelling capabilities enables Oerlikon to quickly take a concept from initial screening to commercialisation," he notes. "One very recent product which was developed through this process is a novel hot corrosion and oxidation resistant MCrAlY bond coat material. Metco 2253A is a recently developed NiCrAlMoTaSiYC material that produces coatings that exhibit significant improvement in thermal cycling as a result of its much lower coefficient of thermal expansion and sulfidation-based hot-corrosion resistance."

Restarting the fleet

With so many aircraft sitting around through the pandemic, Oerlikon foresees MRO business picking up first to support the existing fleet before new make and future engine developments begin again. With the mothballing of so many aircraft there are maintenance issues that have arisen from the pandemic, such as increased corrosion issues. There will be a bigger effort in service and MRO to restart the fleet.

The company plans to strengthen its supply chain and position itself to continue and expand its relationships as a trusted partner for development,



products, and services to support its OEM and MRO customers. In addition, Oerlikon says being capability ready for ramp up of production is the best position where it has the resources and capacity in place to meet the supply demands of the aerospace industry.

Going forward, Oerlikon's plans comprise a one-stop shop and dedicated programme manager to simplify supply chain, conventional machining and non-conventional machining, additive manufacturing plus heat treatment, incorporating hardening, vacuum and HIP furnace, Oerlikon Balzers' thin film CVD and PVD, and Oerlikon Metco's thick film thermal spray and laser clad coating. This will put Oerlikon in a great position as a one-stop shop for special processes.

Finally, the company is looking to collaborate on and develop novel solutions for increased operating temperatures, future sustainability, the use of alternative fuels, such as hydrogen, and expanding into applications relating to space exploration.

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→ Oerlikon intends to be capability ready for the ramp up of production (above)

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