

HICoat® P23 – High performance thermal barrier coating (TBC)

Thermal barrier coatings (TBCs) are designed to meet the ever-increasing demands of companies looking for improved durability and longer service life for their turbine engines. They work by protecting the gas turbine hot section from thermally induced degradation and improving thermodynamic efficiency, which is becoming increasingly important in both aircraft and land based industrial turbine engines.

Most TBCs utilize a two-layer coating system. The bond coat acts to provide adhesion between the metal substrate and the ceramic topcoat while providing oxidation protection to the underlying substrate alloy. The topcoat acts as a heat shield, insulating the substrate alloy, thereby allowing higher operating temperatures and/or reductions in cooling requirements.

Sulzer offers HICoat P23, a high-performance TBC that can be utilized on hot sections of a gas turbine engine. In addition to its smooth exterior surface, HICoat P23 offers the benefits of:

- Increased oxidation and corrosion resistance due to property of powder chemistry.
- Increased bond strength due to optimal porosity levels.

Examples of components which can benefit from this application include turbine nozzles, vane segments, and turbine blades/buckets.



Figure 1: HVOF MCrAlY application

- Smooth surface finish
- Improved performance
- Oxidation and corrosion resistance



Increased performance

Sulzer's HIcoat P23 achieves increased oxidation and corrosion resistance through the use of a high velocity oxyfuel (HVOF) applied MCrAlY bond coat. The HVOF process produces coatings that contain minimal porosity and low oxide content. The bond coat acts to provide adhesion between the metal substrate and the ceramic topcoat while providing oxidation and corrosion protection to the underlying substrate alloy. The top coat acts as a heat shield, insulating the substrate alloy, thereby allowing higher operating temperatures and/or reductions in cooling requirements.

In addition to its smooth exterior surface, the custom powder used to create P23 improves the performance of the TBC. As seen in Figure 2, the porosity is uniformly distributed throughout, leading to higher bond strengths which produce less stress within the coating. Lower stress within the coating make the P23 TBC especially suited for 1st and 2nd stage turbine vanes and blades. Most importantly, the thermal spray and robotic equipment are capable of applying the coating to the full gas path of two portion nozzles that reduce oxidation and thermal fatigue cracking in problematic areas.

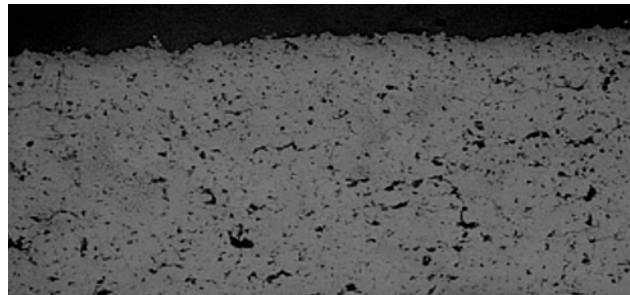


Figure 2: P23 TBC (~0.010")



Figure 3: P23 TBC applied to full gas path of nozzle segment

HIcoat® P23		
	Powder	MCrAlY
Bond coat	Process	HVOF
	Thickness	0.003" - 0.005"
	Specification	STSH proprietary
Top coat	Powder	ZrO ₂ -8Y ₂ O ₃
	Process	Air plasma spray
	Thickness	0.008" - 0.015"

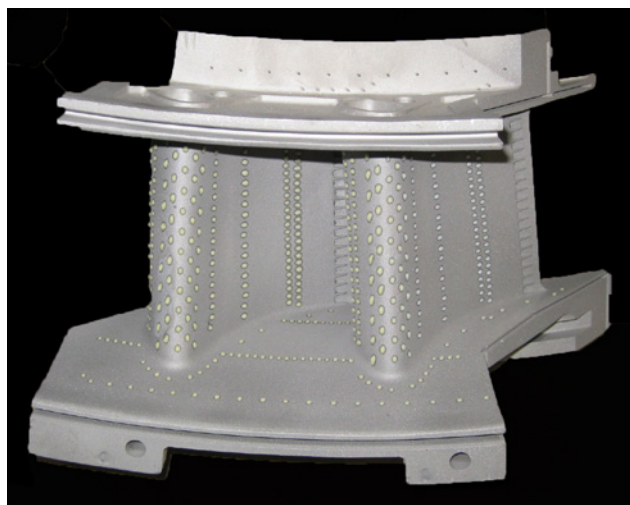


Figure 4: Polymer masking used to keep cooling passages clear



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