

HICoat[®] XTR – Extreme temperature resistant thermal barrier coating

F-class turbines have firing temperatures much higher than previous generations of industrial gas turbines. Thermal Barrier Coatings (TBC) are required to protect the superalloy gas turbine components from these temperatures. TBCs lower the temperature of the substrate material by creating a thermal barrier from the gases in the turbine.

The zirconia used in TBCs has a very low thermal conductivity relative to the substrate material. The exact temperature gradient between the gas and substrate temperature below TBCs depends on the cooling air flow. It is estimated that 0.015" of TBCs can reduce substrate temperatures by over 150°F.

However, typical TBCs have proven insufficient for service in F-class turbines due to the high operating temperature and thermal expansion strain created by these temperatures.

HICoat[®] extreme temperature resistant (XTR) TBC coating is a modified Air Plasma Spray (APS) application designed to handle the extreme temperature and provide thermal protection in this environment. XTR coating is designed for 1st and 2nd stage turbine buckets or blades for F-class gas turbine components and can also be applied to single partition vanes.

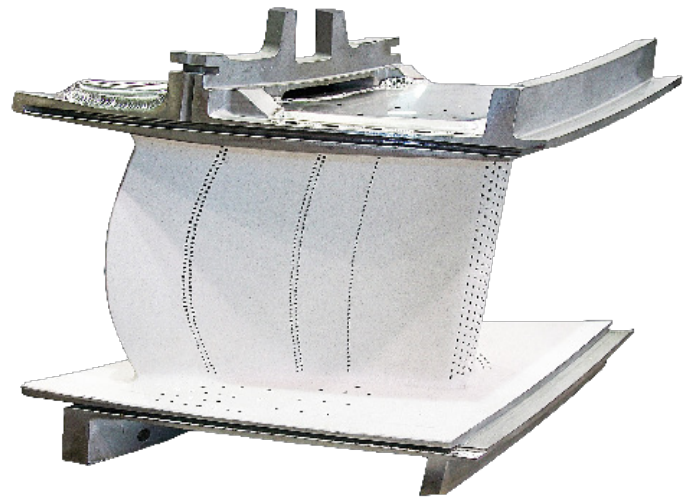


Figure 1: 7FA 1st stage bucket after service

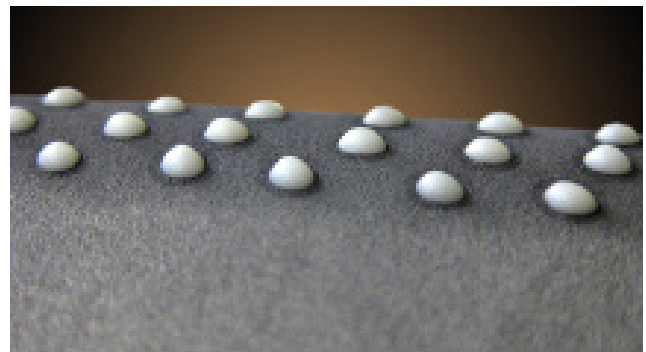


Figure 2: High temperature polymer wicking

- High performance TBC
- Extreme temperature resistant
- Ideal for F-class gas turbines



XTR TBC is created by using a high enthalpy plasma torch that has an enthalpy output of more than double conventional plasma spraying equipment.

The powder used to create XTR is manufactured differently than typical Yttria-Stabilized Zirconia (YSZ) powders. The resulting TBC is resistant to thermal shock and suitable for service in F-class gas turbine.

XTR utilizes a diffused HVOF MCrAlY bond coat. A high temp polymer is used to mask cooling holes during the coating process. After coating, diamond impregnated sanding discs are used to improve surface finish. XTRin is a version without the HVOF bond coat and can be used for GE 7FA combustion hardware.

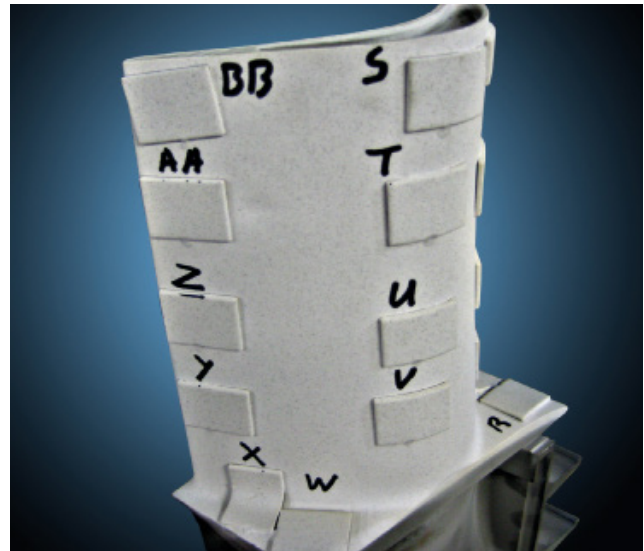


Figure 3: Typical coupon placement used for qualifications

XTR process		
	Powder	MCrAlY
Bond coat	Process	HVOF
	Thickness	0.004" - 0.006"
Intermediate coat	Powder	MCrAlY
	Process	HVOF
	Thickness	0.0005" - 0.001"
Top coat	Powder	ZrO ₂ -7Y ₂ O ₃
	Process	Air plasma spray
	Thickness	0.010" - 0.018"



Figure 4: XTR coated 1st stage bucket



Figure 4: XTR coated 2nd stage bucket



Sulzer Turbo Services Houston Inc.

Houston Service Center
 11518 Old La Porte Road
 La Porte, TX 77571, USA
 Phone +1 713 567 2700
sulzertshouston@sulzer.com