EnvAerospace

Saving fuel *and* the environment.

The Problem

Modern economic and environmental realities require combining fuel efficiency with asset protection -- absolute necessities for airlines to survive.

This problem is often mitigated by engine washing in order to remove calcium magnesium alumina silicate (CMAS) deposits and other ingested contaminants which post-combustion, adhere to engine components and contribute to efficiency loss.

Losses in compressor efficiency over time, lead to higher EGT temperatures, reduced EGT margin, increased specific fuel consumption (SFC) and higher operating cost.

> "... for every 3,000 hours of flight time or 1,000 cycles, new airplanes will lose approximately 1% efficiency. After a few years of operation, the fuel burn performance of an aircraft will tend to stabilize at between 5 - 7% above baseline new aircraft performance levels. Some aircraft will burn as much as 10% or more in certain circumstances."
>
> -- IATA Fuel Action Plan (2004)

Another aspect rests with the efficiency of the Low Pressure (LP) turbine, the condition of which, impacts SFC. On many engines, efficiency levels are already in excess of 90 percent. As such, OEMs will face increasing challenges to capture incremental gains through next generation designs targeted at improving SFC and lowering emissions -- something biofuels have yet to do.

Quite simply, airlines are running out of options to reduce their single biggest cost: fuel -- until now.

The EnvAerospace Solution

CIMO® coated blade

Our family of coatings, including our proprietary carbon implanted metal oxide (CIMO®), have set a new industry benchmark designed to preserve blade aerodynamics. By minimizing CMAS deposits, blades stay cleaner, longer. Deterioration of the gas path cannot be halted, but we can slow it down. More durable than other solutions, CIMO® complements manufacturer's ratings, improving engine performance which benefits the environment.

Nanostructured Coatings

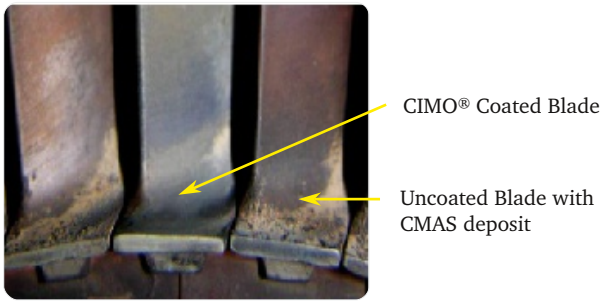
CIMO® technology exploits properties of metal oxide modified ceramic matrices, to exhibit both superelastic and superhard properties. This has led to applications of novel structures for operations in high temperature and other extreme environments.

Nanopulse Source (NPS) technology provides the tools for better control of four key parameters in the surface deposition process: chemical composition, crystalline nano-structure, thickness, and multilayer nano-boundary, while offering new methods of inspection to provide early wear detection for engine components.

Next-Generation Technology

EnvAerospace technology uses a proprietary NPS-PVD coating process. For more than two decades we have developed large-scale equipment and production systems using sophisticated quality control tools to align new nanocoating manufacturing with commercial and industrial requirements.

Hot Section Efficiency



Coated vs. Uncoated

EnvAerospace's compressor and turbine blade coating technologies bring greater engine efficiency and reliability than you have ever expected from today's engines. The result: improved time on wing, lower maintenance costs and greater asset availability.

Advantages

- High temperature erosion and corrosion protection
- Increased Time between Overhauls (TBO)
- Greater Time on Wing (TOW)
- Increased engine life
- Fewer Aircraft on Ground (AOG)
- Improved extreme condition capability
- Minimal CMAS buildup
- Greater blade durability
- Improved EGT margin
- Alternative wear detection

Value-Added Benefits

- Greater fuel efficiency
- Lower operating cost
- Reduced emissions
- Less unscheduled maintenance
- Greater return on assets (ROA)
- Greater return on investment (ROI)
- Competitive advantage in the market
- Increased asset longevity and efficiency

Coating Specifications

Properties	CORTIN® 2401	CIMO® 2404
Temperature Stability	450°C	1200°C
Erosion Rate	3 to 5 times < substrate	8 to 10 times < substrate
Surface Roughness	Ra 36nm	≤ Ra 36nm
Typical Hardness	3000 HV (0.05)	4000 HV (0.05)
Typical Thickness Applied	7 – 25 microns	7 – 25 microns

EnvAerospace Inc.
4-2023 Williams Parkway East
Brampton, Ontario, Canada L6S 5N1

T +1.416.848.7677
F +1.905.791.7679
www.envaerospace.com

The Ultimate in Nanocoating Technology