ACME COATINGS INC.

AEP

Allison Electrophoretic Process

Higher technology
for the highest protection.

AEP PROCESS

The Story Behind AEP

"There are few places where hot corrosion is more intense than in aircraft turbine componentry. There are also few places where protecting against sulfadation/ oxidation is more critical."

William H. Bailey, President, Acme Coating, Inc.

The AEP process was developed especially for aircraft turbine components by the Allison Gas Turbine Division of General Motors. AEP has provided better protection against hot corrosion, improved ductility, increased uniformity of coating and, lowered overhaul costs when compared to the pack cementation process. These goals have been achieved with superior results.

ACME Coatings, Inc. was founded specifically to apply the AEP process and is licensed and certified by Allison to provide the AEP service worldwide.

AEP is approved by the Federal Aviation Authority and the U.S. Armed Forces.

The Process.

Unlike many other coating procedures, AEP is a single process coating -- application methods are the same for all new or used parts. This advantage eliminates the costs of separate installations.

Two basic bath chemistries exist:

AEP 32 (Al-Cr-Mn) For Nickel Base Components

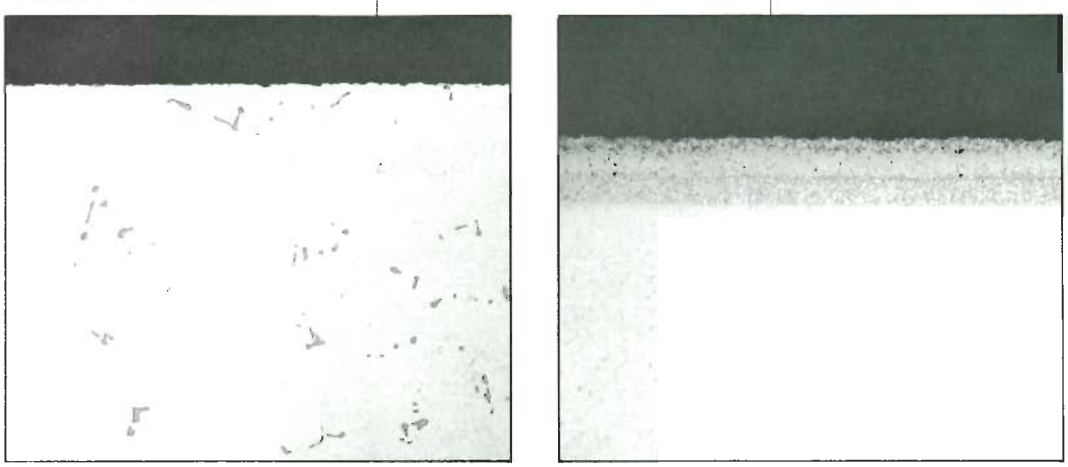
AEP 100 (Al-CrAl) For Cobalt Base Superalloys

The electrophoretic process is especially advantageous for complex component geometries since the electrical potential/ electrode dispersion procedure disperses coating particles uniformly to all surface areas.

The Advantages.

- Increased Turbine Blade and Vane Life
- Greater Resistance to Hot Corrosion
- Improved Resistance to Oxidation and Sulfadation
- Uniform Coating Thickness
- Lower Overhaul and Refurbishment Costs

The Proof.



Shown above are the microstructures of a nickel base turbine component before and after AEP 32 coating.

The Application.

AEP 32 prealloyed powder is used to coat all nickel base turbine blades and most turbine vanes, with the exception of the 1st stage vane which is normally a cobalt base alloy. The prealloyed powder consists of 40% aluminum, 40% chromium and 20% Manganese, with aluminum being equal to or more than chromium.

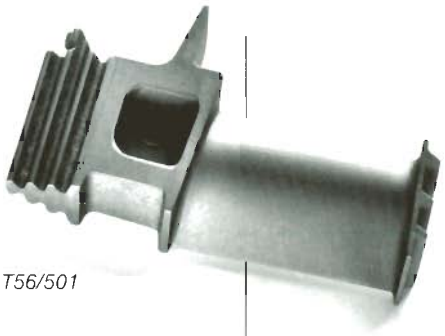
The prealloyed powder is applied to the turbine component by electrophoresis. The coating of the turbine component is followed by diffusion heat treatment, which causes an outward diffusion of nickel and an inward diffusion of aluminum. Manganese diffused in the coating lowers the aluminum content, therefore, increases the ductility of the coating making it less susceptible to handling damage. A nominal 0.002 inch coating is applied to a turbine component by holding the diffusion or solution heat treat temperature constant for 2 hours. Diffusion heat treatment is then followed by a precipitation age process for most nickel base alloys to strengthen the alloy.

Normally, the first two sections of the turbine requires a nickel aluminide or cobalt aluminide coating to withstand the hot corrosion atmosphere of oxidation/sulfadation. In the more high technology engines, which operate at much higher temperatures to attain higher efficiency, the first two turbine sections are coated with MCrAlY or platinum aluminide. The nickel aluminide coatings, AEP 32, are then used to coat the third and fourth sections of the turbine, which includes both turbine blades and vanes.

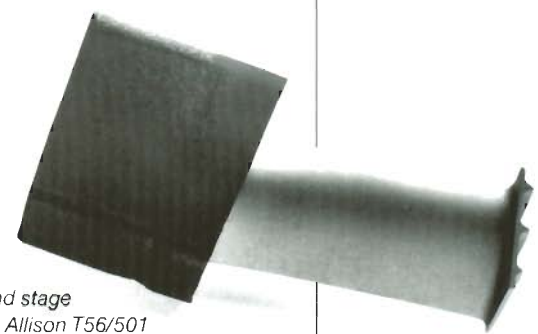
Shown in the pictorials are the first and second stage blades used in the Allison Series II, T56/501 engine. New, these components may be AEP coated to achieve the resulting benefits. Similar overhaul parts coated with pack cementation or AEP coatings may be stripped and recoated with AEP per EPS 10040.

The Allison T56/501 Series III, second stage vane, is located in a static position within the turbine and directs the directional flow of the hot gases produced by the rotational ring of first stage blades. These components may also be AEP coated new or recoated to meet specification.

Figure four depicts the Allison Series III T56/501 saddle. The turbine component, made of AMS 5382, X40 material is required in the turbine to support the burners for directional flow of the hot compressed gases upon the first stage vanes. This part may be stripped and recoated with AEP 100 per EPS 10654 at overhaul.



First stage blade. Allison T56/501 engine.



Second stage blade. Allison T56/501 engine with ACME masking boot.

Second stage vane. Allison T56/501 engine.

Allison T56/501 saddle