IVD aluminum vacuum coating

high-purity aluminum layers

aalberts surface treatment

IVD aluminum vacuum coating

Ion Vapor Deposition, known as IVD or Ivadising, is a physical vacuum deposition process which is used to apply a pure aluminum coating to various substrates, to improve the resistance to atmospheric and bi-metallic corrosion. The stages within the production process are as follows: After degreasing and grit-blasting the parts to be coated are loaded into a vacuum coating chamber and a vacuum is drawn. A noble gas is then back-filled into the chamber, and an electrical charge is applied. This results in a plasma / ionic glow discharge which is clearly visible as a purple haze in the chamber, and results in a super-clean surface. Once this is complete, the coating process can begin. Aluminum wire is fed into a series of superheated ceramic crucible. A high voltage is used to create very high temperatures. The aluminum is then vaporized as an electrically charged vapor, which has an affinity to deposit on to the components, which are electrically "earthed". Once coated in IVD aluminum, the components have a dull grey appearance. The next step is to close the pores in the outer surface of the coating by glass bead peening. The parts can be used as plated, or, more commonly, the pure aluminum surface is then converted to an aluminum chromate using a chemical conversion coating.

Corrosion resistance of IVD aluminum vacuum coating

The process has been developed according to three different coating classes, with a class 1 coating at 25 µm minimum, offering the best corrosion resistance. The class 2 coating is often used on machined parts where tight tolerances apply, and the thickness applied is generally 13-25 µm. Finally the class 3 coatings are generally applied to fasteners and other tight tolerance and detailed components. This process has typically 8-13 µm thickness and offers the lowest corrosion resistance. Corrosion resistance can be increased by converting the surface with a chromate treatment such as SurTec® or Alodine.

The benefits of this process are numerous when compared to cadmium plating. The process is run in a vacuum, and uses high purity aluminum. So there is minimal impact on the environment and the operators. The coating outperforms cadmium in salt spray corrosion tests.

IVD coated components, with a masked internal diameter. The components have been treated with a trivalent chromate after application of IVD.

		Test period	
Coating class	Coating thickness µm	Type I (as coated) h	Type II (chromate converted) h
1	25 +	504	672
2	13-25	336	504
3	8-13	168	336

Minimum performance of the IVD aluminum vacuum coating in salt spray testing according to ASTM B117.

IVD aluminum vacuum coating	process details
Further properties	IVD aluminum vacuum coating • is smooth and uniform and consists of pure aluminum. • provides sacrificial corrosion protection to steel without the risk of hydrogen embrittlement. • provides improved corrosion protection to high strength aluminum alloys. • can be used in contact with aero engine fuels. • prevents contact corrosion e.g. titanium, stainless steel parts in aluminum assemblies. • Neither the process nor the coating create toxic materials. • Corrosion resistance is at least equal to that of cadmium. • The coating can be applied within closely controlled limits. • The coating is highly conducting. • The coating can perform in service at temperatures in excess of 400 °C.
Applications	The coating is currently used in aerospace and defence applications where critical corrosion resistance with electrical conductivity is paramount or where dissimilar metal contact can cause galvanic attack. Typical components currently processed with IVD aluminum vacuum coating include engine and airframe fasteners (steel and titanium), high tensile steel airframe parts, titanium bearing shells, landing gear components and assemblies, sintered magnets and electrical connectors.