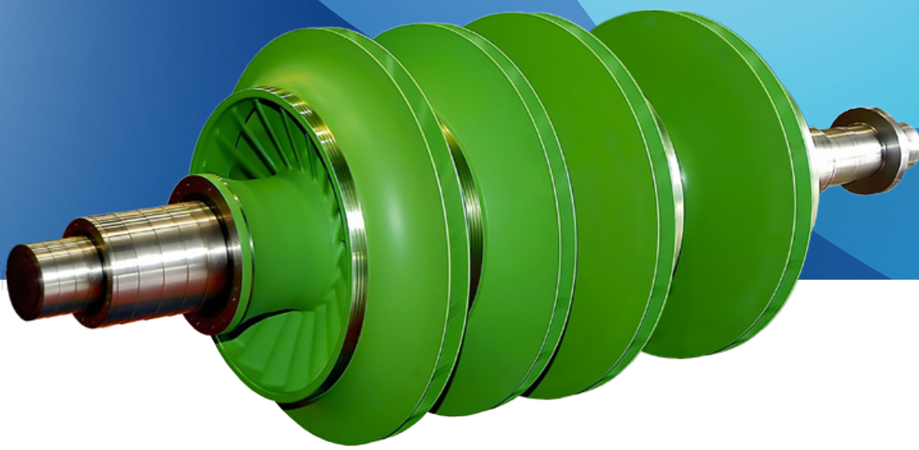
SULZER



- Anti-fouling
- Corrosion resistant
- Ideal for centrifugal compressors

HICoat® A24
Anti-Fouling Coatings

Turbomachinery components either extract energy from moving fluids (combustion gases, steam, air, etc.) or impart energy to those fluids. In service, these components are subjected to corrosion and fouling. Fouling is the adherence of particles and droplets to the surface of the turbomachine blading and negatively affects the performance of a turbine.

There are various forms of fouling, although corrosion fouling and particulate fouling are most pertinent to the turbomachinery industry. Corrosion fouling is classified as a chemical reaction between the reacting fluid and the component surface. Many metals form adherent oxide coatings that serve to passivate the surface and prevent further corrosion. Although this is a self-defense against further fouling, metal oxides typically exhibit quite high frictional properties.

Even relatively thin coatings of oxides may significantly affect turbine performance. Particulate fouling results from the presence of small particles in the ingested air streams. This can cause a sort of sand dune effect and distort the oncoming laminar flow. This degrades flow capacity and reduces efficiency in a short period of time.

Fouling is a serious problem, particularly in the oil and gas industry where sticky hydrocarbon aerosols are universally present. Traditionally, no accommodation has been made in designing turbines to tolerate deposition tendencies of particulate-laden gas streams. Recent developments in coatings have been made to improve upon the anti-fouling and corrosion/erosion resistance and to restore the surface finish of turbomachinery components. A24 is multi-layer metallic-ceramic-polymeric coating providing these properties.

A24 has a metallic based layer which provides corrosion protection. The aluminum in the base coat prevents corrosion by acting as a sacrificial coating on ferrous substrates as shown in Figure 2. It's intermediate layer is an inorganic sealer. The final layer utilizing Teflon® is applied to give it a low-friction property that assists in the anti-fouling quality. Figure 3 shows the multilayer A24 system.

The average recommended thickness is 75-125 microns (3 - 5 mils) for most applications although the coating can be applied much thinner or thicker if necessary. Roughness typically ranges between 30 to 40 R_a (min) at 0.030 in. cutoff.

HICoat A24 is useful in most situations which require anti-fouling resistance and a fine surface finish. Stationary and rotating compressor blading, diaphragms, guide vanes, rotors, impellers and shrouds are all components which would benefit from this coating system. Although most alloys can be coated with HICoat A24, the material works especially well on ferrous alloys.

Figure 1: Typical coating properties

Average thickness	75 - 125 microns (3 - 5 mils)
Surface roughness	< 40 R_a
Coefficient of friction	< .02 (on new surfaces)
Max. continuous operating temperature	260°C (500°F)
Peak operating temperature	288°C (550°F)
Coating adhesion (ASTM D2247)	Excellent - No pick off
Thermal shock, impact survival, solvent resistance	Excellent
Chemical resistance	• Stable 3 to 9 pH • HCL 3 pH (room temp) • NaOH 9 pH (room temp) • Tolulene • MEK • Ethylene glycol • Withstands most solvents, water and fuels

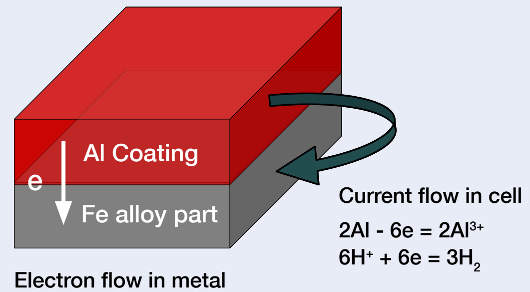


Figure 2: Cathodic protection
The diagram and reactions below illustrate the electrochemistry of cathodic protection (sacrificial anode) of an aluminum coating on a steel part.

The principle of cathodic protection was illustrated by Sir Humphry Davy and Michael Faraday almost two centuries ago.

When two metals are electrically connected to each other in a electrolyte e.g. seawater, electrons will flow from the more active metal to the other, due to the difference in the electrical potential. When the most active metal (anode) supplies current, it will gradually dissolve into ions in the electrolyte, and at the same time produce electrons, which the least active (cathode) will receive through the metallic connection with the anode. The result is that the cathode will be negatively polarized and hence be protected against corrosion.

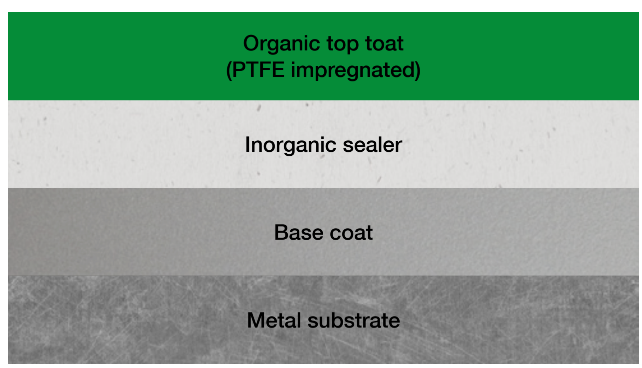


Figure 3: A24 coating system

About Sulzer

Sulzer provides cutting-edge services and solutions for rotating equipment dedicated to improving customers' processes and business performances. When pumps, turbines, compressors, generators, and motors are essential to operations, customers need a service partner they can trust. With our technically advanced and innovative solutions, we give our customers the assurance they need to focus on their operations. Customized solutions help to reduce maintenance time and cost. Our partners' business demands are ever increasing and changing but they can rely on our experts to provide the optimal solution to improve operational efficiency and reliability. We provide high-quality services at competitive prices and delivery times.

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