Electropolishing

Electropolishing is an electrochemical process by which surface metal is removed by anodic dissolution. Sometimes referred to as "reverse plating", electropolishing actually removes metal starting with the high points within the microscopic surface texture. By removing these points, electropolishing will improve the surface finish, leaving a smoother and more reflective surface.

Electropolishing is accomplished by altering the electrode potential of metal piece within a heated electrolyte bath. A cathode is assembled to mirror the surface of the piece. When current is supplied, the electrical charge causes metal ions to be dissolved from the surface of the working piece. The key to the process is the differences in the current density across the microscopic surface. The current density is greatest at high points and lowest at the low points. The rate of the electrochemical reaction is directly proportional to the current density. The increased current density at the raised points causes the metal to dissolve faster at these points and thus levels the surface material.

Benefits

Appearance: The most striking benefit of electropolishing is the reflective physical appearance. Electropolishing is a non-mechanical process. No tools come in contact with the piece so there is no risk of creating directional polishing lines. The material is treated electrochemically, leaving a microscopically smooth surface that is highly reflective and has a bright appearance.

Corrosion resistance: Surface contaminants, including grease, dirt, and iron, are inherent to the metal fabrication process. Mechanical cutting and polishing will leave abrasives and iron particles embedded in the metal. The presence of surface contaminates will disrupt the formation of stainless steels' naturally corrosion resistant surface layer. Electropolishing removes surface material and surface contaminates, and promotes the formation of a thick (greater than 20 angstroms), uniform and protective passive oxide layer.

Mechanical fabrication can create local galvanic differences. Both contaminates and residual stresses within the cold worked surface layer may produce localized galvanic corrosion cells. Electropolishing removes the outermost surface material, and thus minimizes the possibility of local corrosion cells and leaves the surface with an even electrode potential. The improved corrosion resistance is quantifiable and reproducible.

Deburring: Electropolishing is often the best method for deburring. While electropolishing, a part is deburred and polished simultaneously. Because electropolishing is a non-mechanical process, the material hardness has no bearing on the processing time or cost. As described above, electropolishing

naturally removes points and projections from metal surfaces. Grinding, vibration and tumbling techniques are often not suited for detailed and fragile parts. Our technicians have the experience to process all of your parts, including your most complex and fragile components.

Microfinish: Improved microfinishes can do more than improve the appearance of a part. Superior microfinishes improve seals, lower friction, reduce real surface area, allow for easier sanitation, and improve heat and light reflection. The electropolishing process can improve microfinish values by 40%. Because electropolishing is not a surface coating, there is no risk of the surface distorting or pealing over time.

Surface Preparation: Electropolishing will effectively prepare the surface of a material for further processing. Electropolishing leaves a smooth, clean surface ideal for conversion coating, plating, anodizing, or welding.

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