

## What is Electropolishing and Why is it so Important in the Pharmaceutical Industry?

20 Ra w/ EP. That's a pretty common surface finish spec for a piece of stainless steel equipment to be used in a pharmaceutical application. But what does it mean? Well, the 20 Ra is the roughness average of the product surface. The Ra value is the arithmetic mean of the vertical deviations of the roughness profile from a mean line. Basically, it measures the smoothness of a surface. Rougher surfaces create more friction and wear quicker. Surface irregularities are nucleation sites for not only cracks and corrosion, but also bacteria. Mechanical polishing alone cannot create the surface attributes that electropolishing does. This post will focus on what electropolishing is and isn't and why we use it in high purity applications.

Electropolishing is the effective removal of particulate and contaminants on a surface by means of an electro-chemical reverse plating process. Initially components are mechanically polished and buffed to achieve a low Ra value. Electropolishing will marginally improve a surface that has a good mechanical polish, but it also does several other important things. Polishing leaves compounds and some foreign matter embedded deep in the surface of a piece of metal. Electropolishing removes the top layer of metal along with the contaminants in the base metal. This not only removes impurities and surface material and also creates an oxygen rich environment that allows for the formation of an excellent chrome oxide layer and renders the material passive.

The electropolishing process removes material in the peaks of a surface faster than in the valleys, thereby reducing microscopic peaks and causing a leveling action. This improves the surface finish values if the material has been properly mechanically polished. The end product is a bright, clean surface. This finished surface reduces product adhesion, increasing cleanability and preventing product build up.

While there are many different applications for electropolishing, it is used in the pharmaceutical industry to improve surface uniformity, cleanability, and prevent attack from aggressive chemicals by rendering parts passive. While small surface finish improvements are achieved, electropolishing is meant to complement, not replace, mechanical polishing. In conclusion, mechanical polishing is not a substitute for electropolishing and vice versa. To obtain the optimal pharmaceutical grade surface finish you really need both. If you have a question about your products or process surface finish, email us at [sales@tricanada.com](mailto:sales@tricanada.com).