

# Electropolishing

**Common Names:** Electropolishing, Electrodeburning, Electrobrightening

**Applicable Specifications:** No military or federal specification for Electropolishing. Federal specification QQ-P-35 may be referenced for Passivation and Naval Sea Systems Command Document No. 5266629 may be referenced for Electropolishing guidelines. ASTM -967 refers to Electropolishing as an acceptable Passivation process.

**Description:** Electropolishing is an electro-chemical process for brightening, deburring, polishing, and increasing the corrosion resistance of metal parts. Although most electropolishing is done on the 300 series of stainless steels, other metals may also be electropolished.

The electropolishing process is similar to other metal finishing processes in that it utilizes an electrolytic solution to create a surface finish that is both functional and attractive. In this process the parts are made anodic, thus metal is removed. Metal removal is controllable and is usually on the order of 0.0001" to 0.0025".

**Function & Physical Finish:** Since high current density areas are dissolved faster than low current density areas, electropolishing is very effective for deburring sharp edges. Likewise, the dissolving action tends to smoothen surfaces, leaving a bright reflective surface. In the case of stainless steels, surface contamination is removed and the large amount of oxygen liberated at the metal's surface provides an excellent method for passivation. Generally speaking, electropolishing will reduce surface roughness by one-half. Electropolishing also can reveal cracks and fissures in machined casting by exposing the undisturbed metal surfaces. The presence of sulfur in the alloy may also result in "pulls" which will have the appearance of pits.

**Examples of Use:** Automotive trim; food, pharmaceutical, and medical equipment and components, process piping, process vessels, food equipment, electrical, equipment, textile machinery, aircraft components, industrial equipment, marine equipment.

## Considerations & Limitations:

- Base Material: 300 series Stainless Steel give the best results. Materials with large grain size, non-uniform micro-structure, and non-metallic inclusions do not give satisfactory results.
- Shape of parts: Unlimited except that blind cavities or holes may require supplemental cathodes and fixturing. Non-stainless steel parts must be masked or otherwise protected.
- Size: Parts up to 10 feet long and 2 feet wide can be processed in our tanks. Larger parts can be processed using the wand or "in-situ" method. For processing in our tanks, up to 2000 lbs. Our 10 ton crane can be supplemented with commercial heavy lift equipment for processing in our large processing chamber. Systems or equipment larger than can be transported by truck can be electropolished at the customer's facility by special arrangement.
- Quantity: Although quantity affects price, quantity is not a limiting factor. Price is determined by how many parts can be process in an hour.
- Thickness of Finish: N/A
- Masking: Can be used to protect critical machined dimensions.
- Heat Treatment: N/A – sometimes electropolishing is used to remove discoloration.
- Method of Processing: Parts can be racked, or fixtured. Very high current is involved in the process.
- Pre-Treatment: Parts must be reasonably clean. Any residue from protective plastic film or tape must be removed. Normal processing may include caustic soak clean. If heavy weld scale is present, it may be necessary to pickle the parts prior to processing.
- Post Treatment: To prevent a phosphate bloom, parts are treated with a 30% by volume solution of nitric acid, followed by thorough rinsing. Parts with lapped joints or incomplete welds may require neutralization prior to final rinse. For maximum cleanliness, a final rinse with de-ionized water may be necessary.
- Packaging: **Parts are repacked as received.** Parts can be shrink-wrapped. This will be done at the customer's request, at extra cost.

**Quality Control** Process solutions are checked and analyzed following an established schedule and monitored using SPC techniques. We are able to provide profilometer readings (of surface roughness) when required.