# ENE Electropolish #5

The ENE Electropolish Bath #5 is used as received from Hubbard-Hall Chemical Incorporated.
For optimum results and trouble-free operation, the bath should be operated and maintained in accordance with the following operating conditions.

## Features & Benefits

| | |
|---|---|
| Extremely long bath life | Lower total cost of use |

## Operating Conditions

| | |
|---|---|
| Specific gravity | 1.63 – 1.65 at 80°F<br>1.62 – 1.64 at 115°F |
| Temperature | 115 ± 2°F |
| Current density | 175 – 200 amps/ft$^2$ |
| Tank voltage | < 15 volts |
| Current through bath | < 7 amps/Gal |
| Dissolved metal in bath | 0.5% – 1.0% |
| Cathode | Nickel, Nickel plated steel or copper |

The ENE Electropolish #5 bath will be in equilibrium with 0.5% to 1.0% dissolved nickel. At this time, nickel will be plated out on the cathodes at approximately the same rate as it is being removed from the work parts. The feature makes for an extremely long useful bath life.

The cathodes should be removed from the tank on periods of appreciable idleness. Cathode current densities during operation should be in the range of 50 to 100 amps per square foot.

The time required to obtain a very lustrous surface depends on the nature of the nickel. Nickel plate requires less time than sheet or cast nickel and bright nickel plate requires less time than gray nickel plate. The time is generally of the order of 10 to 20 minutes for sheet, 5 to 10 minutes for gray nickel plate and 1 to 3 minutes for bright nickel plate. These time ranges correspond to metal removal, respectively, of 0.0005” - 0.001"; 0.0003” - 0.0005"; and 0.0001” - 0.0002". The grain size of gray nickel plate is such that thin chromium plate (decorative thicknesses) is not clear directly on the electropolished gray nickel plate but is perfectly clear on fine-grained bright nickel plate. Electropolished

gray nickel plate can be given a 1 to 3 minute bright nickel "flash" and then chromium plated with a brilliant, clear appearance. Chromium plate on electropolished nickel may sometimes appear "hazy." If this occurs, a correction can be affected by using the following treatment:

1. Rinse.
2. Cathodically electro clean in an alkaline cleaner.
3. Rinse.
4. Dip in dilute sulfuric acid 5% – 7.5% by weight.
5. Rinse.
6. Chromium plate.

In general, the maximum electropolishing corresponds to a removal of about 0.0005” of bright nickel plate. Bright nickel-plating with this thickness removed, leaving about 0.001” - 0.00125” of bright nickel after electropolishing, can hide minor surface marks having a magnitude not exceeding the scratch from 180-grit polishing. Wild scratches from a poorly dressed, 180-grit wheel cannot be covered. Light die scuff marks on carbon steel can be covered. Parts moved and racked for bright nickel plating generally will be properly disposed for electropolishing.

In the electropolishing of nickel plate, it is well to remember that electropolishing throwing power is better than that of nickel plating. Unless the plate thickness is properly adjusted, the electropolishing might "uncover" the areas of low plating current density where the plate is relatively thin.

Agitation has an important part in securing good color tone by electropolishing. Parts should be racked so that no flat surface is essentially parallel to the direction of work bar movement. Work bar agitation is the best method of agitation, although compressed air or a combination of air and work bar agitation may in some cases be used. Depending on the tank size, rack load, and size and shape of the parts, work-rod movement should be in the range of 10 to 25 cycles per minute with a 2 to 6-inch stroke. Unless it is practical to do so, parts should be racked so that no important surface area is essentially horizontally facing upwards or downwards. Surface areas receiving too little agitation will appear cloudy and off color. When agitation appears to be proper and off-color areas appear on low current density areas, a slight increase in bath temperature will usually correct this difficulty.

Equipment for electropolishing

The ENE Electropolish #5 solution is a mixture of strong mineral acids. Equipment designed and used in this system should take this into account and should be carefully chosen for maximum service. Chemical lead, PVC or Koroseal lined electropolishing and rinse tanks are suitable. Heating may be accomplished by lead steam coils or quartz or Karbate electric immersion heaters. Anode and cathode bars should be made of copper of enough cross-sectional area to carry anticipated currents and should be properly insulated. Connections from rectifier bus bars may be made with adequate copper braid or cable. Electropolishing tanks should be constructed of such dimensions so to provide 3 to 7 inches from the work parts to the cathodes and enough volume 50 that the current in the bath will not exceed 7 amps per gallon. Electropolishing tanks should be provided with valves which will permit convenient removal of solution when and if required. Valves, gaskets and should be chosen with the acidic nature of the solution in mind.

The ENE Electropolishing Solution #5 is a non-fuming bath. However, in operation, a slight acid spray or mist is produced at about one inch above solution level by the evolution of hydrogen and oxygen. To remove this mist which may be irritating, a low draft exhaust should be provided. Three sided ducts constructed of PVC or similar plastic or acid resistant painted steel ducts can be used. Exhaust capacities required are of the order of 150 cubic feet per minute. Additional information concerning ventilation and exhausting is available on request.

Power sources for electropolishing can be provided by DC generators or rectifiers. Units capable of producing 6 to 15 Volts, full control with enough amperage capacity should be used.

Racks for electropolishing should be constructed of plastisol coated copper with contact points made of titanium. Cross sectional areas for the racks and contact points should be adequate to carry the current which will flow through the rack. Since titanium is not affected by the electropolishing bath. racks so constructed will have almost indefinite life. Bare copper racks or copper racks plated with 0.001” - 0.002” tin can be used. This type rack, however, will be affected somewhat by the electropolishing bath and will not give the same length of service as the titanium tipped racks.

Racks for electropolishing should be constructed of plastisol coated copper with contact points made of titanium. Cross sectional areas for the racks and contact points should be adequate to carry the current which will flow through the rack. Since titanium is not affected by the electropolishing bath. racks so constructed will have almost indefinite life. Bare copper racks or copper racks plated with 0.001” - 0.002” tin can be used. This type rack, however, will be affected somewhat by the electropolishing bath and will not give the same length of service as the titanium tipped racks.

Control

Maintenance of specific gravity within the specified range is usually enough to provide good control of the bath. Hydrometer measurement is suitable, and water is added or evaporated as required. The electropolishing bath contains a small percentage (0.1% to 0.25%) of hydrochloric acid. The hydrochloric acid serves to permit the dissolved nickel to plate out on the cathodes. Control of the hydrochloric acid will maintain the bath at the 0.5% to 1.0% dissolved nickel metal equilibrium. If the concentration of dissolved nickel exceeds 1.0%, off color electropolishing may result. Increasing the bath temperature to 120°F to125°F may correct this condition. At nickel concentrations of 2.5% to 3.0%, the dissolved nickel will precipitate. Analytical methods for control of the solution are available on request.
As was previously indicated, the ENE Electropolish #5 solution is a strongly acid mixture. Precautions usually exercised in the handling of strong acids apply to the handling of this solution. Goggles, acid resistant clothing and gloves should be worn when handling or transferring the solution. Disposal of the solution and rinse effluents should be in accordance with existing local regulations covering sewage and waste disposal treatment.

As a service, the Hubbard-Hall Chemical Company provides for periodic analysis checks of the electropolishing solution. Pint samples of the solution should be submitted to our laboratory on a monthly basis for analysis and recommendations.

Proposals and assistance for the design and choice of equipment for installations is also offered as a service.

WARRANTY: THE QUALITY OF THIS PRODUCT IS GUARANTEED ON SHIPMENT FROM OUR PLANT. IF THE USE RECOMMENDATIONS ARE FOLLOWED, DESIRED RESULTS WILL BE OBTAINED. SINCE THE USE OF OUR PRODUCTS IS BEYOND OUR CONTROL, NO GUARANTEE EXPRESSED OR IMPLIED IS MADE AS TO THE EFFECTS OF SUCH USE, OR THE RESULTS TO BE OBTAINED.

---

## Our people. Your problem solvers.

For more information on this process please call us at
1-800-648-3412
or techservice@hubbardhall.com