B.C. FINISHING SYSTEMS

ELECTROLESS NICKEL GUIDE
for EN-RT

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INTRODUCTION ON EN-RT

The EN-RT is a specially formulated electroless nickel product that can be used at room temperature to slightly above room temp. It primarily used to plate non-conductives that have been processed with stannous chloride, copper paint, silver paint, or our line of GP conductive paint. The EN-RT can also be used for plating steel, iron, lead, brass, copper, or zinced aluminum.

Plating with an electroless plating solution is autocatalytic which means it plates on a condition and not electric, as is the case with a convention electrolytic plating bath. The condition on the EN-RT is that it will plate only between the temperatures of 75F to 100F.

Unlike conventional heated electroless nickel, such as our EN-M, this product does not have to be heated. But with every advantage, there is a disadvantage. The EN-RT will not plate a thick coat like the EN-M. It is used primarily for strike-plating and just getting a good all over coverage prior to continuing into a conventional bright plating bath.

Read this pamphlet TWICE prior to beginning your setting up the plating process. Also, when mixing the EN-RT, please look at the label prior to mixing. There has been occasions where a customer will pour in Part#A and Part#C by mistake, therefore ruining the solution. Check label prior to mixing.
PLATING ONTO CONDUCTIVE PAINT

Paint the conductive paint onto the part as directed on your product label. **Hint:** It may be wise to paint a coat of clear laquer prior to paint with any conductive paint if the part is porous. Examples of porous parts are leaves, insects, wood, plants, etc. Plastics, sea shells, rocks, or plaster are the kind of items that will not need to be pre-lacquered. This porosity will cause the absorbtion and wasting the conductive paint. You will need to wire a brass, copper, or aluminum metal wire onto the part prior to painting with the conductive paint, as is also the case of regular electroforming. Be sure to brush or spray the paint an inch onto the wire itself. Let paint dry overnight or as directed by the label.

Hang the part in the EN-RT or EN-M tank with the existing wire that was placed onto the part prior to painting it. Do not use galvanized wire. Once you hang the part on this wire or rack, do not touch it until you are done. Your fingerprints may hinder the plating process. Spray part or rinse part in clean water. Spray quickly with tap water again, if you are not sure. Lower part onto a bus bar across the EN-RT tank. Turn OFF air agitation. Check the part after 30 seconds to a minute. Do you see any gas bubbles coming off the part? Look carefully. If not, then the plating will have to be initiate manually via DC current. Hook a rectifier, a 6V battery charger, a rectifier set on 2-6V, or a couple of ‘D’ flashlight battery hooked inline. Connect the negative lead to the part and the positive lead to a small piece of CLEAN stainless steel that will sit across the tank from the electroform. Hold the stainless piece on one side of tank, inside the EN solution. Turn the current on for a few seconds until fizzing of part is apparent. Let it fizz with electrical assistance for only a few more seconds. Remove stainless anode. Look at part carefully. Is it now lightly fizzing? If so it is plating now. If not, let part sit in tank for a couple of minutes. If no bubbling is apparent, re-initiate.

Once the part is plating, turn ON the air bubbler to provide air agitation. Plate until the part is fully covered with nickel. With our EN-RT (which only serves as a strike coat), once full coverage is apparent, the part is ready to continue to Bright Nickel, Brass, Heavy Gold, Heavy Silver, etc. With the EN-M, plate as thick as needed because this product is a high efficiency bath and will plate as long as needed.
POLISH AND BUFF

STEEL, IRON, LEAD, COPPER, BRASS, ZINC

ELECTROKLEEN SOAK: 30 SEC TO 60 MIN (TW)

ELECTROKLEEN electrolyte clean: 10sec-120sec

RINSE (TW)

METAL ACTIVATOR (TW)

see Activator section

RINSE (TW)

PLATE

ELECTROKLEEN SOAK: zinc-quick dip, steel, iron, & lead-10 to 60 min, copper & brass-10 to 20 min, stainless-quick dip

ELECTROKLEEN electrolyte clean: zinc-10sec, copper & brass-1min, stainless-less than 30sec, steel, iron & lead-up to 2 min

METAL ACTIVATOR:
12oz/gallon steel-60sec zinc-<5sec iron-60sec copper-30sec lead-60sec brass-30sec nickel-90-120sec

STRIKE NICKEL: Activates stainless steel by making the part positive for 30 seconds. Then reverse the current back to normal - part(-) and nickel anode(+) and plate for 5 minutes.
ALUMINUM PLATING CYCLE

ALKLEEN SOAK CLEANER
Submerse part for 2 to 10 minutes. Scrub if necessary

RINSE

HP ETCH
Dip part for 5 to 30 SECONDS.

RINSE

DESMUT
Submerse part for 1 to 2 minutes.

RINSE

ZINCATE
Submerse part for 30 seconds to 2 minutes until smooth dove gray color is achieved evenly all over the aluminum part

RINSE

PLATE PART WITH ELECTROLESS NICKEL
Plate for 10 to 30 minutes
SETTING UP A SMALL PLATING TANK

Cut out 2 slots on each side of the bucket so the bus bar will fit snugly into the slot. This is the center bar that the part will hang from. As for the anodes, the Electrocleaner - Just use HP Stainless Anodes and hang the hook on the lip of the tank. Or you can cut two big pieces of 1/16" inch thick stainless steel or use a few small strips on each side and bend two copper hooks on each anode that will hook to the lip of each side of the tank.

Tip: Use a hacksaw to cut out the notch

Wire the anodes as shown
Use a hacksaw to cut a notch on your plating container. You can use a rectangular bar (as shown), a round solid copper bar, or copper tubing. It does not really matter.

The negative current will be attached to the center bar (where the part being plated is going to hang) while the positive current will be attached to the anodes in the front and back of the tank.
ELECTROKLEEN / SOAK CLEANER:
For electrocleaning and soak cleaning of all metals but aluminum and zinc die cast.

Operating temperature range - 110F to 160F
Soak time - 5 minutes to an hour. Manual scrubbing is recommended for removal of buffing compounds
Electroclean - 20 sec to 2 minutes at 25 to 40 amp per sq/ft
Concentration of Electrokleen - 8 ounces per gallon
Adds - Add 1 ounce per gallon after about 500 parts have been processed
Tank - Steel, stainless steel, polypro, HDPE, mild steel
Heater - Any kind 75W per gallon of solution (e.g. 300W for 4 gallons)

ELECTROLESS NICKEL RT:
Operating temperature range - 75F to 100F. Do not plate at lower than 75F
Plating time - 1 minutes to 30 minutes depending on your specs
Adds - See Electroless Nickel Adds
Tank - Ceramic coated steel, Pyrex, polypro, HDPE. Tank must be NONCONDUCTIVE or it will plate the tank.
Heater - Glass, quartz, or Teflon only in the winter
Bath pH - 9.0 to 11.0 with 10.0 being optimal
Bath loading - 0.1 to 1.0 sq/ft per gallon
Agitation - Mild air recommended
MAKING UP ELECTROLESS NICKEL SOLUTION

First of all, put on your goggles and your chemical resistant gloves. Remove your bus bar. Double check the cleanliness of your tank. Now fill tank about 1/2 full with DISTILLED water.

Now SLOWLY add the 4.0 oz/gallon of ENRT-A and add ENRT-B at 11.5 oz/gallon. Mix.

Add distilled water up to total volume. Heat solution up to 90F. Check pH. It should be 10.0. Now solution is ready to use. Get initial specific gravity with battery hydrometer (see next page). Now solution is ready to use.
ELECTROLESS NICKEL ADDS

Due to the fact, EN does not use nickel anodes in the tank, the nickel concentration of the bath will get depleted as you plate more and more parts.

To achieve consistent results equilibrium between the metal coming out of the solution and the metal needed in bath for proper operation, must be maintained. To measure the amount of solids in the solution tests are done with a hydrometer. You should use a battery hydrometer, the kind you find in an auto parts store (shown below). Make sure that it is the kind with a moving indicator and not the floating ball type. You will need to check the specific gravity of a newly made EN solution and use this as a baseline to which you can adjust your bath periodically as plating continues.

You must replenish the electroless solution by adding 2 parts of Component C to 1 part of Component B. This should be done on a semi regular basis. Adds can be done at 0.5 oz/gallon of A and 1.0 oz/gallon of C about every 20 square foot you plate. But the most fool-proof method is just to take the specific gravity periodically and make adds to maintain your baseline reading. If you do not keep track of the specific gravity, then you must keep track of the surface area plated. Try to make small adds often rather than one big add. Keep some kind of a log of the amount and size of the parts, so you’ll be able to determine when to make the adds to the bath.

After each add, you should check the pH of bath with Litmus paper or a pH meter. The pH must be between 9.0-11.0. If the bath is out of range, raise pH with PH-DW and lower pH with PH-UP. Add a drop at a time and test pH. It does not take much to change pH.
MAKING UP HP ELECTROKLEEN

Fill tank 2/3 full with tap water. Heat the tap to at least 140°F. Once that temperature is reached.

Add 6-8 ounces of Electrokleen powder per gallon of total tank volume. Precision is not too much of an issue for this tank. Add the preweighed Electrokleen to the warm water. Mix thoroughly.

Top off with tap water slowly. This solution is not harmful but take care by wearing goggles. It hurts like heck if you get even a drop in your eye. Stir again until even color is achieved throughout the tank and all solids has been dissolved. Now heat to operating temperature.
CLEANING

On aluminum or zinc die cast, you can continue straight to the Alkleen. Now once you put the part into the Alkleen aluminum soak, it'll take the solvent film off quite easily. You might want to scrub the part lightly with a soft brush or a sponge to make sure that the entire surface area of the part is entirely free of dirt, buffing compounds, and solvent. Once you think it is clean, try a water break test. Dip the part quickly into clean water, when you pull it out of the water. Look at the part, does it sustain a water film throughout the entire surface area? If yes, then the part is ready to continue onto the next step. If there is any oil or dirt on the piece, that area will not sustain water. That being the case, go back and immerse the part into Alkleen for about 30 seconds and rescrub. Check the water break test until you achieve a satisfactory result. One other good time to check for the water breaks is while rinsing just prior to the initial plating step. Remember the part must be CLEAN, CLEAN, CLEAN. So clean you can eat off of it. I guarantee that 80% of your problems will be a related to a cleaning problem. Take it from me, I know, because it still happens to me on a every single day at the shop. It also always better to check, double check, and then triple check for dirt in prior to plating rather than to try to plate a dirty part. The result for that is having to spend another hour or two redoing the part again from scratch after stripping the part.

Steel, copper, nickel, brass, and iron all are cleaned and prepare pretty much the same way. First, let the part soak in the Electrokleen for a 10 to 20 minutes. Now turn on the current with the part being negatively charged and the stainless steel anodes being positively charged. You will see some vigorous bubbles coming off the part. Do not worry, that is only the cleaning action. Let it electroclean for 2 minutes on steel or iron, while you should only electroclean for 30 seconds with copper or brass. You should reverse the current on the electrocleaning process for the last 10 seconds. Make the part positive and the stainless electrocleaner anodes negative. This will dispel any hydrogen gas and the last remain specs of dirt from the pores of the metal. You can also soak and electroclean zinc die cast, but it must be very briefly. First, do all of the preliminary cleaning on the zinc with the Alkleen. Now, quickly dip the part in Electrokleen and scrub with a soft brush, then electroclean with the part being positive for only six or seven seconds. No more! Extended exposure of zinc die cast to Electrokleen will damage the part, so be careful.
METAL ACTIVATION

As mentioned briefly in the beginning of this publication, most metals have to be activated prior to plating. Some metals, such as steel and copper, can be plated without activation, yet it is always better to do it anyhow because you will get better plate adhesion on the metal. Other metals such as nickel, stainless steel, and zinc will not plate properly without prior metal activation.

HP Metal Activator can be mixed at 12 ounces per gallon of tap water for activation of steel, iron, nickel, iron, and lead. Dip these metals into the metal activator for 60 to 120 seconds. For copper or brass dip part in the activator for 30 seconds. For zinc, shorten the submersion time to no more than 5 seconds.

Stainless steel is activated very differently than any other metal. First, soak part for only 1 to 2 minutes, scrub, and electroclean for only 20 seconds. Excessive exposure of shiny stainless steel to Electrokleen will dull the metal. After rinsing thoroughly, go right to the strike nickel. Put the part into the strike nickel, with the current in reverse (part being charged positive). Make sure that the power supply is on prior to putting the part into the solution. Leave the current in reverse for about 30 to 40 seconds. Now switch the current back to normal (part is now negative) and plate with the Strike Nickel for 5 minutes with 0.1 to 0.2 amps per sq./in.

Aluminum does not get activated prior to plating. After cleaning, dip the aluminum in HP ETCH for 15 to 30 seconds. Rinse. Desmut for 60 seconds. Rinse twice. Submerge the part into the Zincate. The Zincate solution covers the naturally unplateable aluminum oxide layer with zinc oxide. This zinc oxide layer will make the aluminum temporary able to take a plate. So after Zincating the aluminum, you must have the aluminum in the Strike Nickel within 2 minutes. No more, or the aluminum will become passive again. After the Strike Nickel, you can go onto copper or bright nickel.
FINAL TIPS

Here are some final tips that will help you during your plating process.

1) Part must be CLEAN. I cannot emphasize this enough. 50% of the problems I still have at my shop stems from some kind of cleaning related issue.

2) After the part has left the cleaning process, you cannot touch the part. Your finger prints will interfere with the plating process.

3) Do not bump the part into anything after cleaning.

4) Always keep part wet once the plating has begun. If part dries, it must be activated with HP Metal Activator before you can continue.

5) If you are not sure what the part is made of, follow these steps:
   A) If a magnet sticks to it, the part is steel or iron, if not...
   B) Take a couple of drops of Desmut and drip it onto the part:
   C) If it turns white or light gray, it is aluminum
   D) If it turns black, it is zinc die cast
   E) If it turns a dove gray, it is stainless steel

6) During EN plating, do not check the part if you can help it. If you really feel a need to do so, then do it only once and do it quickly. Nickel becomes passive in a few seconds. If EN is going to be followed by another plate, rinse thoroughly and continue on to the plate right away. If you let nickel sit idle for a very short time, it becomes passive and has to be reactivated in HP Metal Activator. Nickel will not plate onto itself unless activated.

7) ALWAYS WEAR PROTECTIVE GEAR WHEN PLATING. Wear chemical resistant gloves, goggles, and a rubber apron. Also you MUST keep a few boxes of baking soda around to neutral the corrosive solution when they spill or get splashed on your clothing.
SOLUTION AGITATION

AIR AGITATION: Air agitation is the use of a pressurize air system to force air through some sort of air sparger (air tubes) at the bottom of the anodizing tank to keep the metals in the solution as well as the temperature even throughout. This is highly recommended in your Electroless Nickel. It will keep the tank temperature even throughout the tank and the chemicals evenly dispersed. For a setup up to 15 gallons, you can just use an appropriate aquarium air bubbler as the agitator and you can make your own sparger out of PVC or pretty much any kind of plastic tubing. For setups over 25 gallons, you'll definitely need to buy a blower as an air source. We personally sell Spencer Blowers and Rotron Blowers. You CANNOT use an air compressor because you'll introduce oil into the solution no matter how well you filter that solution. Just use plain old plastic tubing or pipes for your air sparger. Just run the line from the air source to the bottom of the tank and drill or poke a few holes into the plastic tubing so that air can escape from the sparger at the bottom of the plating tank. You want only see mild bubbling at the surface of the solution. This solution movement will keep your solution temperature as well as the plating chemicals evenly dispersed throughout the plating tank. See the diagram on the below.
RINSING

RINSING:
Rinsing is probably one of the most abused steps in plating and anodizing. We all take it for granted because we think “it is just water”. Proper rinsing can make or break your process. There are a few things to keep in mind about how to set up and use your rinses. One, you should have a separate rinse for every process tank. If you are using 9 chemicals in your line, you will need at least 9 rinse tanks. The Desmut process you be followed by rinses. One to neutralize the solution (3% baking soda and water) and the other to rinse off the baking soda that may have clung to the part. Each plating step must have its own rinse to avoid cross contamination of the solution. For instance, if you share your EN rinse with your copper rinse, you will eventually drag enough EN into the copper tank to ruin it. Secondly, if your solution from a certain process is made from distilled water, the rinse should probably be distilled water too. The plating solution and your Zincate must be made with distilled water, so the post rinses for each of these tanks should be distilled water. Lastly, you should use some kind of water spray to aid in your rinsing process. For your plating and Zincating processes, use a spray bottle filled with distilled water to spray the part as it comes out of the process tank. Then spray it again after you rinse the part. As for all the other process such as Etch or Alkeen, just use a hose and lightly spray the part, or you can use another water spray bottle filled with tap water. If you are using 2 different spray bottles, be sure to make which one is distilled water. This will ensure you do not mix the two up.