The Application of a Special Coating Using the Electrochemical Metallizing Process
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Electrochemical Metallizing (ECM) is known by many names. It is the application of applying a metalurgically bonded metal to a given sub-straight. Should we choose only a selected area to repair, we may hear the process called SELECTIVE PLATING. We may have a very small area which must be brushed on manually introducing the name BRUSH PLATING, I prefer ELECTROCHEMICAL METALLIZING as it covers all of the above.

Some realize, but many do not, that the Electrochemical Metallizing Process is indeed a Molecular Bonding. Meaning we must change the molecular structure of the sub-straight (base metal) of a given material to except and marriage with a metal bonding material (solution). At the point of contact we have an alloy (microinches) of the two materials. We can now build on that marriage. As in any marriage, if we do not have a good bonding at the base or try to build to much to fast, it will crumble.

From the base (bonding material) we must choose a metal (solution) for a designated purpose. Among these being a ware surface, filling in a ding, resurfacing, with gold, worn fingers on a P.C. board, adding a coating to a high strength metal for solderability or silver on a copper bus bar for greater continuity. We are putting back material which has been eroded away or simply over machined. It matters not how or why it is not there, it can be replaced to a zero tolerance if necessary.

There are a vast number of applications for the Electrochemical Metallizing Process. If there is a problem the ECM Process is the answer.

Terminology
Now to explain a bit of the terminology. The Electrochemical Metallizing Process (ECM) is the electrodeposition of a plateable metal on any given sub straight. The process at one time was somewhat limited to research and development, maintenance and manufacturing. It today has a much broader scope.

Do not think of the Electrochemical Metallizing Process in the same mind with tank plating. It differs in that the anode and cathode make physical contact. With the ECM process, the cathode is the negative lead from a rectifier and is attached to the work piece. The anode is the positive lead from a rectifier and is attached to an applicator.

There are numerous types of applicators, one being platinum. Another, graphite in its purest form. These applicators, for the best results, should be formed to the contour of the repair area. Applicators must be insulated from the work piece, if not when contact is made with the work piece it will arc, closely resembling an arc welder.

The most common insulator is cotton secured with a cotton sleeve. Advantages with this wrap is if you are dip plating, it holds the ECM solution.
Scotch Brite held in place with a rubber band is another good insulator. This wrap is used when the flow thru method (solution pumped continuously to the contact area) of plating is used.

The Electrochemical Metallizing Process is a wet process. The work area must be saturated with solution at all times.

Solutions, an answer to your problems. Yes, this is true. With the ECM Process, solution is a water base metal crystal, containing chemical which when combined with a positive - negative electrical current displaces metal on a given sub-straight for whatever purpose. Thus the solution to your problem.

The deposition time for the ECM Process is high with exceptional dimensional control. Deposits are extremely pure, porosity is low and hydrogen embrittlement relatively free.

The Electrochemical Metallizing Process not only adds material it can etch it away when the polarity of the rectifier is reversed to negative. The work piece becomes the anode and the applicator becomes the cathode, removing microinches. Then changing the rectifier back to the positive position, those microinches, for a highly reflective non porous, hard, smooth, or whatever finish your specs may require, can be plated back with those microinches holding a very tight finish part tolerance.

Anodizing is just another property the ECM Process holds, using the same reverse polarity. Machined parts being anodized, may for any reason have a very small area that did not receive anodizing. The part can be salvaged by using the ECM Process on just the area missed, thus saving a very close tolerance, high dollar part.

Electrochemical Metallizing Applications
There are many ECM applications to be exploited, putting gold on Thruster Plates (Columbia) for a metal to metal seal, filing scratches in Hyradic cylinders (which hold the cable that catch in-coming aircraft on an aircraft carrier), touching up electrolysis nickel on a seismic pod (which will be placed on the ocean floor), anodizing drilled holes which had been missed in the electrical wall of a helicopter when the wiring harness was near completion, striping solder from the fingers on a mother board which is loaded and replacing the gold. These we can easily relate to. Some applications are unique, one being coating a particle plate (dentures) with gold, as the recipient was allergic to the nickel they were made of.

Nickel XHB As A Method Of Salvage
As a Service Company to the Railroad Industry, our objective is to salvage as many Railcar axles as the Association of American Railroads (AAR) specifications allow us.

The axle metal configuration is forged steel. The wheel seats and journals are then machined. As the only area we repair is the journal, this is our only concern.

A press fit roller bearing containing an in-board and out-board race area and a seal wearing is pressed on to the journal. A press fit we know demands a very tight tolerance.

Railcars travel many miles, carry all kinds of cargo, and go through a vastness of terrain and climates. The journals wear!!!

This is where the ECM Process make complex problems with the axle, repairable.

Due to the un-even wear of the bearing, we can with basic techniques correct the unevenness and metalize the journal back to size and finish within one to two ten-thousands an inch, with absolutely no machining.

Deposition rates are high and the machines take up very few square feet. A
single operator may work an axle from start to finish, have Quality Assurance do finish inspection, and prepare it for shipment, cutting down on handling time.

The economics of the ECM Process for salvaging axles is very good.

**Conclusion**

The ECM Process is a very narrow niche of Production in the Railroad Industry. It is recognized for its excellent ware surface, smooth finish and ability for fast turn around time. Send the *Bad*, we return the *Good*. With the ECM Process *ALL* can benefit.