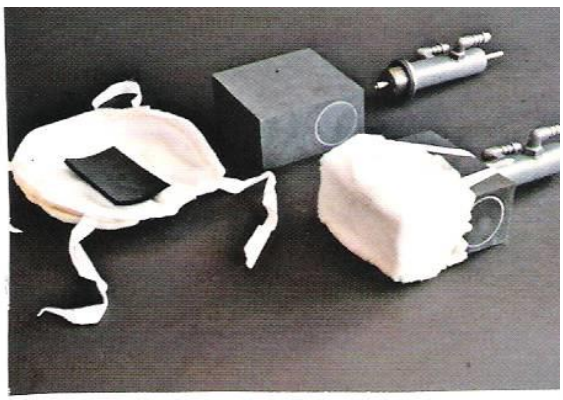
Selective Electroplating

Selective Electroplating without immersion tanks may be considered as an efficient complement to conventional bath plating.

The plating technique, similar in its application to a classical machining method, allows within a very short time the deposition of electroplate onto specific areas.

The electroplate is obtained by means of a Plating Tool and an Anode adapted to the area to be plated and through which the solution is supplied. Both Tool and Component are connected to the terminals of a suitable Power Unit. The relative movement between work piece and tool yields an electroplate of specific properties:

- Excellent adhesion in correctly applied cases, superior to bath plating;
- Little or no porosity;
- Insignificant hydrogen embrittlement;
- Controlled hardness;
- Specific crystalline structure; and
- Minimum loss of fatigue strength.



Surfaces liable to be plated may vary from cm^2 to m^2. The deposit thickness ranges from a few microns to several tenths of a millimeter. Special electrolytes developed for the use with the selected plating process include 24 pure metal coatings and a number of alloy-coatings.

All Power Units for Selective Electroplating are equipped with an Ampere-hour-metric system that comprises of:

- An electronic-metering set, an actual integrating device, that measures the quantity of current that is passed through the D.C. circuit on account of the frequency of current, basis of time, and transmits to the pre-selection counter logical information.
- A six-digit Impulse-Counter with an accuracy of 1/10, 1/100, 1/1000 of a Ampere-hour provided with a pre-selection device that allows for
    - the programming of plating operations with accurate control of the metal weight deposited;
    - a cut-off plating operation as soon as the desired thickness has been obtained; and
    - the setting of repetitive plating cycles for series plating (production line).

This stable integrating system without inertia ensures an excellent precision independent of the plating rate adopted, current density applied or plating solution to be deposited.

Special electrodes have been developed for the use with the Selective Plating process to enable fast deposition rates at very high current densities, 50-500 Amp/dm^2.

Specific characteristics are:

- High metal concentration;
- Long shelf life;
- Hardly effected by variations of temperature and current densities; and
- Most of these solutions are non-toxic

Coatings from these solutions have specific physical properties which are common to this plating technique:

- Excellent adhesion;
- Fine-grained deposits and harder than bath plating;
- Non-porous deposit, even if thickness is insignificant; and
- Low stress and hydrogen embrittlement.

Electrolytes of sound metallurgical structure and specific features are obtainable from the following electrolytes:

- copper acid
- copper alkaline
- aviation cadmium
- nickel pre-plate
- nickel builder
- nickel Sulfa mate
- nickel-cobalt

Selective Plating preparatory solutions

Unlike conventional bath plating, Selective Plating solutions should be deposited onto a clean and properly activated and receptive surface to ensure good adhesion.

It is therefore essential to remove all visible films of dirt, oil, grease and oxides that may impede adhesion of electroplate.

A large range, adapted to the pre-treatment of the different base materials, of preparatory and etching solutions is available:

- Cleaning and deoxidizing;
- Cleaning and deoxidizing Z;
- Etching A;
- Etching B;
- Etching C;
- Activating 1; and
- Depassivation.

The Selective Plating Process is widely used throughout all branches of the Industry:

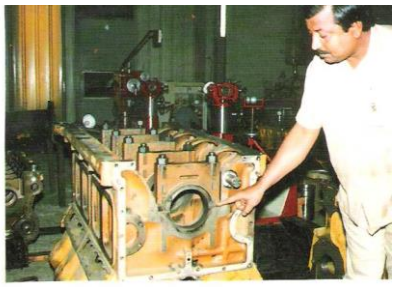
- Aviation & aerospace;
- General Engineering;
- Machinery & mechanics;
- Nuclear;
- Marine;
- Navy;
- National defense;
- Electrical & electronics;
- Vacuum;
- Printing;
- Automobile; and
- Railways.

Main applications include

- The resizing and reconditioning of miss or over machined parts;
- The repair of worn components such as
    - shafts
    - journals
    - bearings
    - bearing housings
    - bores
    - engine parts;
- The improvement of electrical performance by reducing electrical resistance and wear effects on bus bars, printed circuits, contacts, commutators, etc;
- Corrosion protection coatings;
- Anti-fretting coatings;
- Anti-friction coatings;
- Coatings to ensure good sealing; and
- Coatings to facilitate soldering and brazing.

Examples of Selective Plating Applications

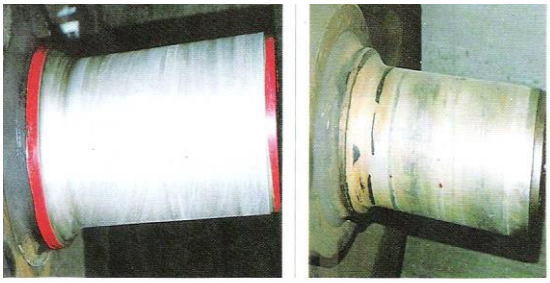
Scratch refilling operation



Reworking on external seal surface.

250 Crankshafts under machined by 100 Microns saved by Selective Plating.
Shafts plated to size
No final machining
Rework time per part - ± 45 min

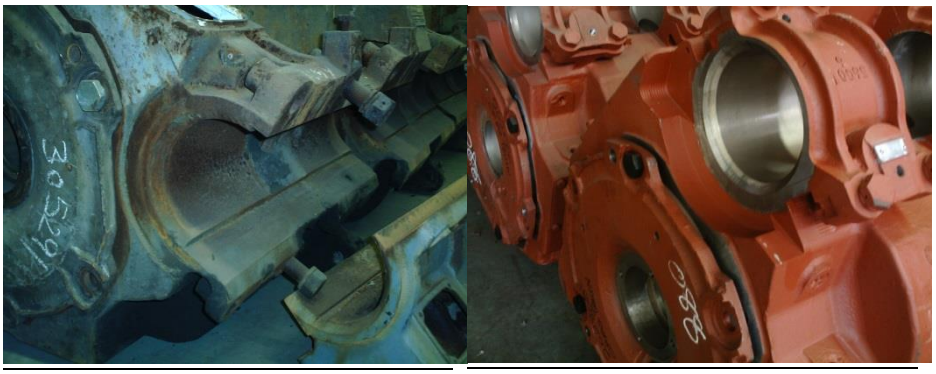
Selective Plating workshop



Axle plated with Ni-Cobalt and axle on for restoration of axle journals (left). Axle after 4 years in service (right).

The advantages and benefits of this electroplating technique are numerous and invaluable as some of the illustrated applications will prove:

- No extensive masking;
- No dismantling – less downtime;
- Deposits only on the area requiring an electroplate;
- Portable equipment is taken to the job location and hence facilitates plating in situ;
- Plates to required dimensions, no need for final machining;
- Selective Plating Rates are up to 60 times faster than conventional bath plating rates; and
- Provides unique plating possibilities for such components that are inconvenient or impossible to plate by a conventional bath plating method, i.e.
  - too large or too heavy parts;
  - difficult to plate base metals; and
  - parts which would require expensive and time consuming masking.



Traction Motor Casing

Before After