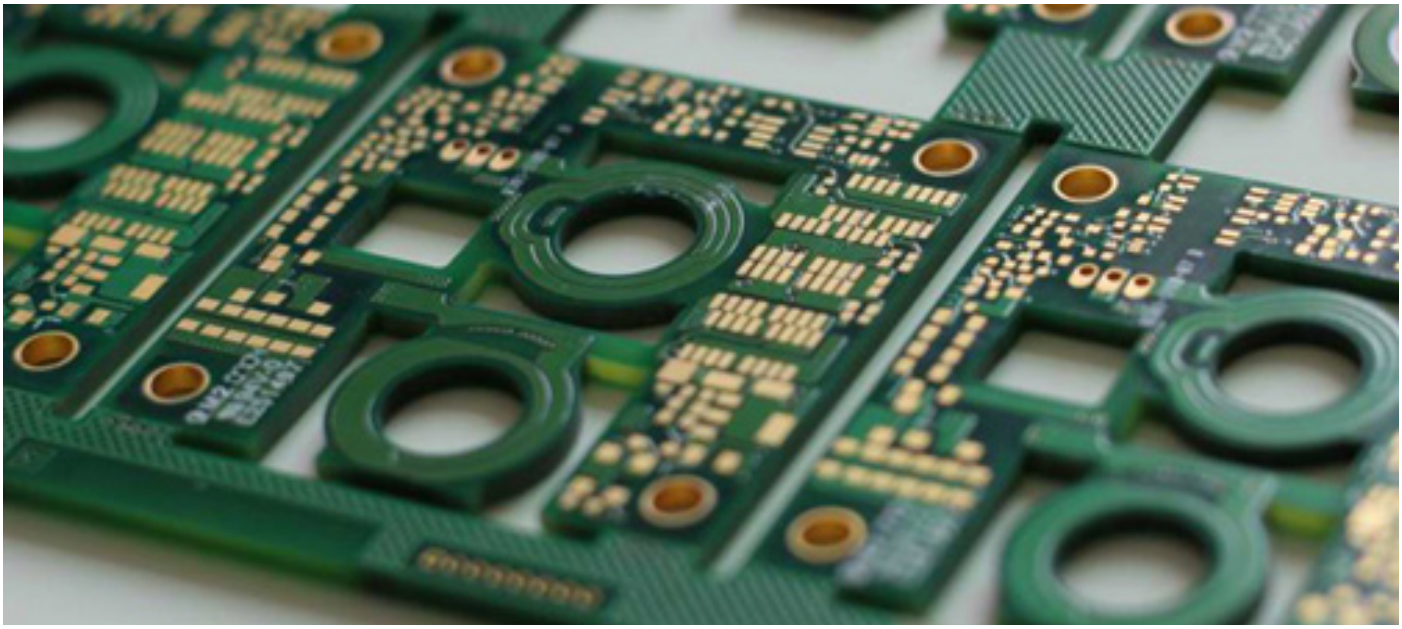
PCB PLATING MACHINE



Printed circuit boards serve as a platform for connecting several electronic components. The material of the PCB card does not conduct electricity like plastic or fiberglass. When you look closely at a printed circuit board, you will notice some thin lines of copper inside it or on the board's surface. These thin lines between the layers of plastic are responsible for directing electricity through the board to the right places where it is necessary.

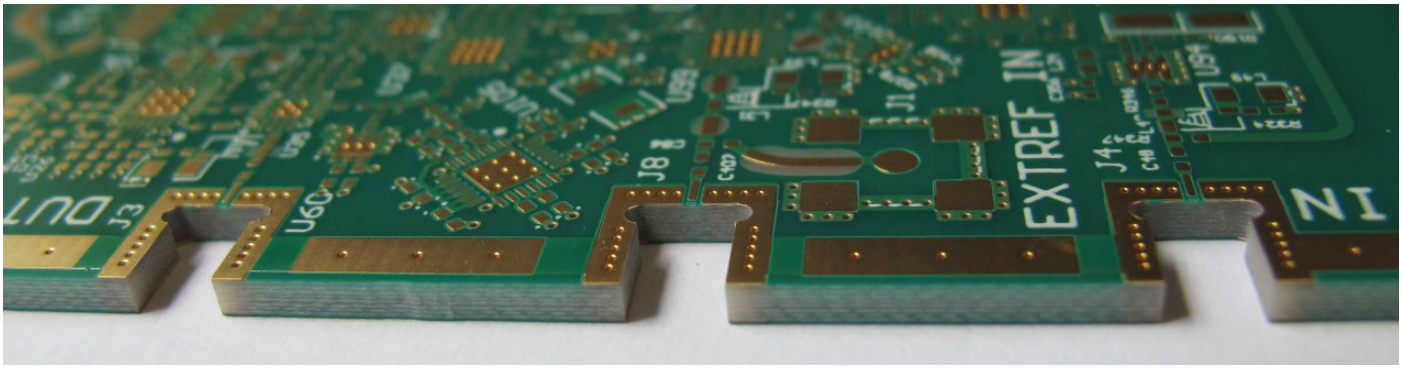
To attach the electronic components to the printed circuit board, a metal is used since it is a conductor of electricity. With the presence of the metal in the board, power can travel from among all the components in electrical circuits. Other names for printed circuit boards are etched wiring board or printed wiring board.

The advent of printed circuit board brought a new dawn in the electronics industry. Many electronics and computers today use PCBs because they are reliable, affordable and rugged. The only thing about this board is that the initial cost and layout usually demands more than other boards like point-to-point circuits or wire-wrapped construction. However, PCBs are cheaper, consistent in producing high volume and also faster.

Depending on the printed circuit board which a product requires, there are single-sided PCBs, double-sided, flexible board and multilayer PCBs. Technological Advancement brought about the introduction of the roll-to-roll flexible board and IC support board. These forms of printed circuit boards in the typical manufacturing process, multiple layers, fine lines ultra-thin board was a challenge to the PCB manufacturer's capacity because the board's wet process mainly the electroplating process is the primary key of the entire PCB production.

Printed Circuit Board Plating Process

The printed circuit board plating is a significant factor in PCB production. Plating is essential to avoid oxidation or even deterioration of the copper on the board. Also, this plating process serves as a protection to copper circuitry and a surface where you can solder while assembling every component on the PCB. Therefore, you must follow the right process to get it right.



PCB Plating process involves the following steps:

Step One: Classifying the process
Acid Copper Plating /Gold electroplating tin

Step two: The plating Process
The first is "Picking" Then you start the "full plate copper plating" afterwards, you do the "graphic transfer", "acid degreasing", then carry out the "secondary counter-current rinsing" which will lead to "micro-etching" then do the following "secondary, picking, tin, secondary counter-current rinsing"

Countercurrent rinsing
This starts from "pickling" to "copper electroplating" followed by "countercurrent rinsing" then the "plating of nickel", "secondary washing" "acid leaching" the "gold plating", "recycling" then "2-3 grade pure water washing" and finally "drying".

Step 3 Process Description

A. Picking acid

The leading role and reason for picking acid are to:

1. Remove the oxides on the surface of the board
2. Activate the board
3. To achieve a 5 % or 10% general concentration.
4. To ensure that water from sulfuric acid does not enter the board

Also, the time for acid leaching should not exceed the limit if you want to prevent oxidation while using the board. When the acid looks cloudy or you notice that the copper content is very high, replace it so that it will not pollute the plate surface and the copper plating

You can use C.P grade type of sulfuric acid.

B. The role and aim of the board plating copper also called Panel-plating, copper or plate

1. To provide protection for the chemical copper when it is deposited on the board
2. To facilitate chemical oxidation of the copper so that there wouldn't be any form of corrosion after you remove it by electroplating.

Process Parameters for full-board plating process

1. The components of sulfuric acid sulfate bath
2. Using high-acid of low-copper formula in making sure that there is uniformity in the thickness distribution of the plate and the deep-hole capacity.
3. Content of sulfuric acid 180 g/L
4. More than 240 g/L
5. 75 g/L Copper sulfate
6. A trace of chloride ions in the bath for gloss effect
7. The quantity of Open cylinder or light agent is 3-5 ml/L
8. Addition of copper agent to match the effect of the production board or to supplement thousands of hours.
9. Current calculation of the board plating is normally 2A/ square
10. Plate length dm x width dm x2 x 2A/DM2
11. Cylinder Temperature will be at room temperature not more than 32 degrees but better at 22 degrees.

C. Acid Degreasing

To remove the copper lines that appear on the surface oxide to ensure the binding force of the nickel plating.

D. Micro-corrosion

To clean the copper lines that are roughening so that there will binding between the primary copper and copper plating

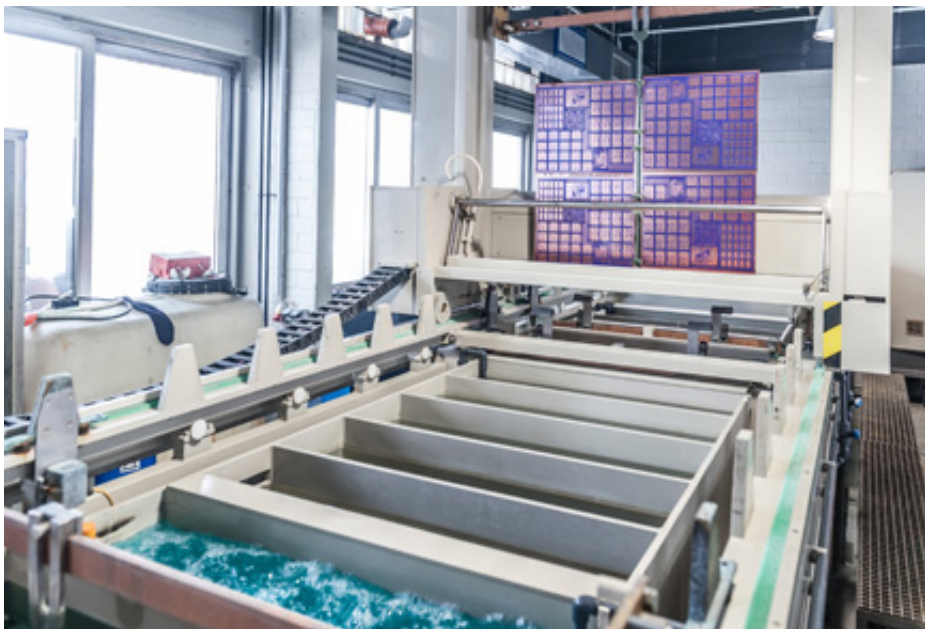
E. Pickling acid

To remove surface oxides, activate the board and prevent water instability

F. Copper Circuit

To achieve the thickness which the copper lines need to meet current load.

PCB Plating Methods



There are four kinds of plating methods in PCB production namely: “refers to the row plating equipment, through-hole plating, reel-linked to the choice of plating” and “brush plating”

1. Refers to the type of plating

To provide high wear resistance or lower contact resistance, this method of plating becomes necessary. The method involves plating a rare metal on the edge connector, edge contact or gold finger of the printed circuit board.

This technology behind this process is called PCB manufacturing and it describes a type of plating or its protruding part. The process of this plating method is:

1. Remove the tin-lead coating
2. Wash them
3. Scrub with an abrasive scrub
4. Activation diffuse
5. A 4-5 thickness of nickel
6. Clean off mineral water
7. Treat in Gold infiltration solution
8. Gold plating
9. Cleaning
10. Drying

2. Through-hole plating

There are many ways of creating the electroplated layer on the substrate which refers to “hole wall activation”. PCB manufacturing of printed circuit usually requires the use of intermediate tanks for storage. These tanks, on the other hand, require maintenance and control.

Therefore, the through-hole plating method is very important for producing the drilling process subsequently. When the

drill bits pass through the foil and substrate, the heat which it generates melts the insulating synthetic resin and other debris from the drilling will accumulate and touch the hole wall that is exposed in the foil. This debris on the hole wall will in turn cause damages to the plating surface later. Another thing that happens is that the resins which melted will leave heat axis on the substrate cell wall and cause poor adhesion to some activators.

To eliminate many chemical processes, to follow one step, and thermosetting which will enable continuous coating inside the cell walls, it is more suitable to fabricate PCB prototypes to work with a low viscosity ink which will create a high conductivity and a high adhesion coating inside each via. This ink has a strong adhesion and can bond easily with many hot-polished walls thereby eliminating erosion.

3. Reel linked to choosing plating

This method involves choosing electronic components pins like connectors, transistors, integrated circuits and flexible circuits to realize good contact and corrosion resistance.

This PCB plating method involves the use of both automatic equipment and manual plating line. Instead of separating every pin plating which is very costly, you can make use of bulk welding. As for the plating production, it will be the thickness of your metal foil punching at the two ends. You can use mechanical or chemical methods to clean and use any of gold, nickel, rhodium, silver, button, copper-nickel alloy, or nickel-lead alloy for further plating.

4. Brush Plating

This PCB plating method is an electrodeposition technique whereby few of the parts are left out of the electrolyte while electroplating. This electroplating method involves electroplating a specific area which has nothing to do with other areas. What happens is that the portion to use is plated on the PCB. An anode like graphite is usually wrapped in a cotton swab or other absorbent material to bring the solution to the place that needs plating.

PCB through-hole Plating

The PCB through-hole plating is a method that uses a copper compound and nano-particles of a metallic copper to decompose using a high temperature. When this is done, a conductive layer forms on the already processed surface and afterward, depositing solid copper through the usual method of electroplating.

This method is a very simple one to follow. All you need to do is to place your board right inside the activator solution and place it in an oven for about thirty minutes. You then proceed to wash it when you bring it out from the oven and then place it again in the galvanic bath. This will enable it to execute the copper electroplating that has the essential thick layers. This is the secret of the activator solution because with this done once; you can then proceed to process many other boards with it. When the activator solution is not in use, you can even store it for a very long time and it will still maintain the quality of its properties.

This formula was created many years ago by the then known USSR to replace the costly palladium based technique. Even after the demise of the USSR, this technique was continued until the start-up of the 90x group. This group of chemists is headed by Oleg Lomovsky who acquired the patent of an industrial version of the now commonly used method known as PCB through-hole plating.

How to prepare the Activator Solution

Things you will need:

1. Copper Sulfate
2. Distilled water
3. Liquid Soap
4. Calcium Hypophosphite[Ca[H2PO2]2]
5. Ammonium Hydroxide

You will need to get all these ingredients in little quantities of each. Make sure that the minimum quantity that you can acquire for each of them will be up to 1Kg.

Preparation:

1. Dissolve 30g of the copper sulfate in a 140ml water
2. Stir it steadily until the copper is dissolved.
3. The solution will change its color to light blue then pour in 22g of the calcium hypophosphite into the solution and stir again for about 3-4 minutes.
4. After this, sediment that consists of gypsum which changes the color of the solution will appear.
5. Filter this solution by making use of a funnel cover with filter paper
6. Add to the sediment 100ml of water again
7. You can then proceed to bring out the funnel and add 40ml out of 25% of ammonium hydroxide.
8. Put in about 5-6ml of the liquid soap and turn it properly for some seconds.
9. Also, add calcium hypophosphite up to 8-10g and stir it also for a few seconds to hasten the process.
10. Then store it in a tightly closed container. Make sure that the storage is a dry place and not exposed to sunlight, pets or children.

This solution needs to be maintained therefore check it up from time to time. Concentrate your checking on the calcium hypophosphite sediment which is inside the container. You can even add more calcium hypophosphite grams if it is needed. Step 2 Preparing the Copper Laminate'

This is another important step in PCB through Hole plating because it will define the quality of the holes after the plating process. The things you need to do are:

1. Cut the laminate a little larger than the size of the printed circuit board
2. Drill the PCB
3. Take the board to a light and inspect the holes to ensure that copper chips are not in them
4. Sand copper the surface using a flint paper to remove any copper borders around the holes. Pay more attention to the opposite part.
5. Wash the circuit board with a detergent which contains soft abrasive
6. Rinse the printed circuit board
7. Ensure that the holes are all clean by inspecting them again.

Step 3: Activate the surface of the board

1. Open the activator container and put the board in the solution for at least 2-3 seconds.
2. Lift the board above the liquid surface so that the activator can flow down.

3. Check to see if there is a change of color and if not, put the board into the solution again and lift immediately above the container surface.
4. If the holes are thoroughly wet, remove the board from the activator, rotate vertically so that excess activator will go back to the container
5. Distribute the activator uniformly by closing the container and rotating the board

Step 4: Thermal Treating

You will need an electric oven and you also have to control and monitor the temperature.

1. Put the board in the oven and start the heating . When the temperature gets to 125 degrees C, maintain it there for 10 minutes or even 12-15 minutes for better results.
2. Resume heating till 175 degrees and also leave it there for another 5, 7 or 8 minutes
3. Stop the heating process and open the oven. However, leave the board inside the oven till the temperature crosses 100 degrees.

Step 5: Cleaning the Board

All you need to here is to use water, liquid soap, and a soft sponge to rinse it. Make sure you don't use liquids that contain soft abrasives to avoid damaging the copper layer.

After cleaning, the board is ready for electroplating.