

# RACK PLATING EQUIPMENT

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Electroplating is a process of coating a metal part with another metal, chromium or silver through electrolytic deposition. The reasons for plating metal parts sometimes are to make them resistant to corrosion, enhance their paint adhesiveness for decorative purposes. One of the different methods of plating metal parts is Rack plating. When you have a project that involves electroplating delicate metal parts, your best option is rack plating.



## What is rack plating?

Rack plating involves hanging the parts on a metallic fixture that will provide a galvanic cell circuit to handle the electroplating process. With the presence of pins, screws, and wires on the jig, there will be the little electrical contact for the whole process to make sure that the finishing for delicate parts and intricate contours of the metal will be of a high-quality. This method is not the easiest but it is the safest for some metal parts that can easily damage during the cascading and tumbling involved in barrel plating.

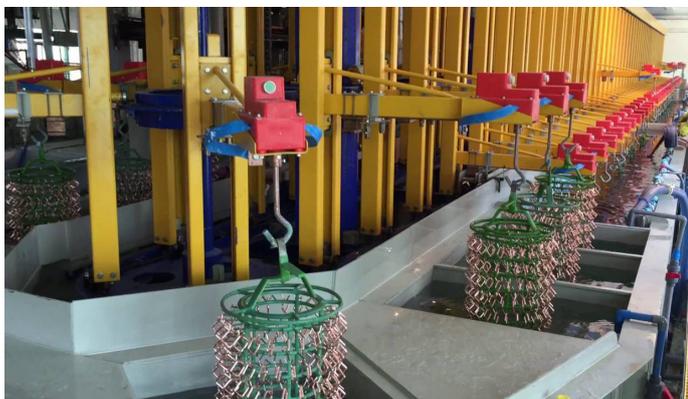
Rack plating method is the best option for parts that are too big to enter a barrel. Most of the types of plating that works best with this method is aluminum plating and zinc plating and the popular plating solutions for the process is often chrome and nickel. Therefore, before you use this method of electroplating, consider the size, the shape, and quantity of the parts. One advantage of rack plating is that it can help you to reduce cost and time of electroplating parts one by one in a plating solution. It can hold many parts the same time although not as many as barrel plating. Another benefit of using the rack plating method is that it keeps metal parts safe from damages and scratches since you will have to space them from each other on the plating jig. The only downside of rack electroplating method is that it is expensive and labor-intensive because you will spend a lot of time while hanging the metal parts on the rack.

## Rack plating equipment

There are many rack plating equipment that is both cost-effective and appropriate for your electroplating requirements. Some of the rack plating solutions available are:

1. Stainless Steel Hoists
2. Stainless Cantilevered Hoists (Side-arm)
3. Steel Railrider Hoists
4. Overhead Cranes
5. Carousel, RTM

All these rack plating equipment solutions come with special Environmental Enclosures and Energy-Conserving designs. There are many controls which you can find in the above rack plating equipment. The aim of these state-of-the-art controls to minimize the losses people incur as a result of heated tanks and also to reduce at least 80% exhaust cfm.



All the available rack plating system that can successfully fulfill the needs of your project as mentioned above come with controls like:

1. Production-Scheduling/Optimized Controls that are flexible
2. Improved real-time simulation/verification of the layout and capacities
3. Superior, in-depth fault diagnostics
4. Global, modem service (PC front-end & PLC) that is available every minute
5. High accuracy laser and infra-red hoist positioning systems
6. Available in LINUX, UNIX and Windows platforms

Many of the rack plating equipment available are automatic. These automatic rack plating systems can handle processes like plating, anodizing, phosphate coating, cleaning, and dye penetrant inspection. For automatic rack plating machine, the construction follows some technical requirements, many plating tank-related traffic, electrical systems, racks, ventilation systems, power equipment, filtration system, air-mixing system, temperature control heating system, level control systems, and cathodic mobile devices which forms a whole multi-functional automatic control system. The line can be used for rolling and hanging plating dual.

The rack plating equipment consists of the following in its total design.

The mechanical design which includes the rack, the crane, and cathode. For the electrical design, the types of equipment are IPC, inverter, PLC and touch screen for its control system.

The rack plating method also makes use of auxiliary machines to ensure efficient electroplating. Some of these machines include:

1. Spray equipment; this ensures that the workpiece is washed and cleaned in the bath.
2. Power supply; since DC or Pulsed power must be the plating power supply and since they are not the same for different plating bath, the current while electroplating should be within a particular error range. Therefore, a high-frequency supply that can produce constant voltage, constant density control, constant current and IGBT module a special driving protection method.
3. Temperature control; this system is used to ensure that the temperature will be adequate for the electrolytic degreasing and the plating bath. To ensure a high temperature, there are a temperature sensor, heating tube, temperature controller and electrical relay.

## Rack Plating Process

Rack plating process follows simple steps that will ensure a uniform finishing for large and fragile parts that cannot pass through other plating methods. On rack plating method, the metal parts to be electroplated are hung on the plating rack. Afterwards, metal hooks or bonds will be used to hold the parts in the right position. The metal parts are dipped in the solution. After submerging the parts in the solution, apply electrical current. This method of plating is very effective for partial or selection coating. However, uniformity of plating is always difficult because the parts that pass through rack plating are always in complex geometry unless you use robbers or anodes to enhance efficiency. Another thing you can do is to customize racks to fit the geometry of any metal part and its finish requirement especially when the demands specification is complex. To achieve this purpose, you must use experienced engineers that can make it happen.

## Rack plating Applications

This method of plating is both times consuming, labor intensive and expensive. However, there are some plating requirements for metal parts that can only be electroplated using the rack plating. Although it doesn't handle varieties and high volume plating at once, it is still a versatile plating method.

There are many rack plating services available for copper alloys and nickel-silver, aluminum steel, steel, Inconel and Monel and stainless steel. Many plating needs which you can use rack plating is as follows: bright nickel plating, copper plating, electroless nickel plating, silver plating, electrolytic plating and gold plating.

## Fundamentals of plating rack design

The main reason for constructing an electroplating rack is to keep a metal part in a position that will bring it closer to the plating current flowing from the anode. Applying finishing on the metal part will protect it from damages or rupture during the fabrication process. Many of these parts that need to be plated like we already said come in different sizes and shapes which may lead to constructing a customized rack that will electroplate it efficiently.

Therefore, it is imperative to ask some key question before fabricating a plating rack as an engineer. The user, on the other hand, must also be specific in providing the right answers to the following questions:

1. What kind of electroplating do you want to do?
2. What electroplating solution will you use for the process?
3. What production rate will you use to achieve cost effectiveness?

4. Will you strip the tips with a proprietary solution?
5. Where is the specific portion to be plated on the part?
6. What will be the holding position of the piece to ensure adequate density of the finish?
7. What tip design do you require for part positioning?
8. With this rack, design help you to achieve easy and quick part racking and part offloading?

To make sure that these questions are properly handled, you must develop the basis of a good plating rack design. The first thing to do is describing the part, identifying the unique surface problem, shading, and tip marking. Also, determine the place where the piece will be held and determine the number of pieces that you can hold per rack using the current of each rack. Then determine the weight of every metal part to be electroplated in relation to the rack's total weight.

Another thing you must specify before the rack design is the dimension. Make sure that each of the plating racks will suitably fit with the metal part attached to the smallest process tank in the line. To get the right dimension for the rack design, check out the following:



**Length;** the first thing to consider is the length of the materials. If you want to achieve a uniform finish on the metal parts, you must make sure that the distance between the rack cathode bar and rack bottom is correct. Don't forget that the space requirements of each tank to steam coils, anodes immersion heaters, air agitation pipes, overflow dams, filters, and mechanical agitation differs from the other. The ideal length is to have the plating rack many inches above the tank bottom and the metals two inches below that surface of the tank. Also, remember to check the levels of the solution in every process tank on the line. Get your dimension beginning from the lowest level. When you do so, you can be sure that complete immersion will take place as you proceed with the plating process.

**Width;** the width dimension will be different depending on the projects you are handling. Just get it right to avoid rack damages as a result of slow production and automation jams.

**Thickness;** make sure that there is enough space between the anodes to hold the metal parts to be electroplated. If the rack is manual, the dimension of the thickness will affect your ability to move the racks from one tank to another. The workings of a plating line that use straight cantilever crane equipped with a lifting hook are as follows: Hook and crane will be driven by separate motors differently. The motor speed is controlled by an inverter. Fix the proximity sensors and switches on a suitable position on your crane and make sure that you install the sensors according to positioning rail so that hook lifting and crane translation will be placed in the right position by the sensors.

On a typical automatic rack plating equipment line, the process through which the crane operates will start from the loading station and move the metal parts to the pre-processing station. From the station, the parts will land in the plating bath station. Afterwards, the crane will move the parts to the after-processing station and unloading station later.

The process for loading is that you will hang the plating workpiece by yourself. Afterwards, then hang the electroplating products. When you are done, lift your hanging workpiece and wait till the sensor gets close to its upper limit. Move the crane to the right till the sensor gets closer to the 2nd then, stop. At this point, you will notice that the hook is hovering above the station for pre-processing.

Now, bring the hook down till the sensor comes down to the lower limit, when it is there, put your plating workpiece in the bath solution based on the timing period requirements for handling the plating products.

When the product reaches the time period, lift the machine hook so that the electroplating parts will rise. Keep lifting it till the sensor gets to the upper limit. Afterwards, start the next step.

Move the crane right so that the sensor will get to the 3rd sensor. This step will place the metal parts above the bath station. Drop the hook till the sensor gets close to the lower limit, put the parts into the bath solution depending on the timing period requirements for plating the parts. When the electroplating process concludes, raise the hook till the sensor comes close to the upper limit then enter the next step.

Move the crane again to the right till it gets to the 4th sensor which will place the plated parts above the after-processing bath station. Lower the hook till the sensor reaches the lower limit and submerge the electroplated parts in the after-processing bath so that the process of recycling and water cleaning will take place.

Afterwards, raise the hook and move the crane to the right so that you can get to the unloading station where you will remove the parts and start the whole process again. The structure of this whole process is a straight-line cantilever which includes cranes, rack structure and different kinds of plating baths.