

Overcoming Electroless Nickel Bath Initiation

Q. We are running an electroless nickel (EN) bath over brass, and we are having trouble initiating plating. What could be causing this?

A. If your EN bath is not initiating plating — or starting and stalling — it can be extremely frustrating. When working with brass, your first instinct is usually to reclean or reactivate the part. The surface prep of the substrate is certainly important, but if you've already looked at that and you're still seeing poor initiation, it may be the health of the bath that is the culprit, not the part.

Following are three common issues related to the health of a plating bath that will directly impact bath loading, stability and control.

Bath loading

Bath loading is a critical variable in the operation of an EN bath. It is important not to underload or overload the bath. Bath loading refers to the total surface area of parts in the tank versus the solution. This ratio, usually expressed in square feet per gallon (ft²/gal), determines how fast the chemicals are consumed and how stable the bath remains during plating.

Low/underloading: Occurs when you have too little surface area compared to solution volume. This can lead to edge pullback and nonuniform thickness. Underloading will cause the bath to become chemically imbalanced by building up the accumulation of orthophosphite at a faster rate, which poisons the bath and slows plating.

High/overloading: Occurs when there is too much surface area relative to solution volume. In this scenario, the chemistry is depleted too quickly, and frequent adjustments need to be made to stabilize the bath. Overloading slows plating deposition and can cause solution volume to grow unnecessarily from the repeated additions.

Improper loading (over or under) can impact plating initiation and affects the bath's ability to produce a consistent, quality finish. It is recommended that shops work with a chemistry supplier to follow ideal loading ranges to keep the bath operating properly.

Bath stability

EN baths also contain stabilizers to help prevent spontaneous nickel plating in the tank. However, proper addition of stabilizers is crucial as too little can mean an unstable bath, while too much can slow the plating rate down or cause the bath not to initiate plating. It can be common to have multiple operators who might be making additions without a clear analytical picture of the levels.

If you are struggling with a slow plating rate, or your bath won't start plating at all, be sure to accurately verify your stabilizer level. To avoid an imbalance that can interfere with bath function and plating efficiency, stabilizer



The balance between hypo and ortho

EN plating is effective thanks to a chemical called sodium hypophosphite (hypo), the reduction agent that enables nickel to deposit on the substrate. As hypo reduces the nickel ions, a byproduct called orthophosphite (ortho) is generated. Over time, it accumulates in the bath and builds up (usually after 8-10 metal turnovers) but it can happen sooner with poor loading. Too much ortho will poison the bath, slowing it down or stopping it from plating altogether. Routine testing and analysis are critical to maintain the proper balance between the depletion of hypo and the buildup of ortho.

additions should always follow supplier recommendations and be determined by titration or other controlled testing methods. Reputable suppliers will have EN baths that have optimized stabilizer levels to help the brass initiate.

Initiation tips: If you have contacted your supplier and have exhausted chemistry and physical operating parameters to fix the problem, a common tip or method to help initiate plating on brass is to put the brass part in contact with a steel part to help jump start or initiate plating. This is done by connecting a rack of brass parts to a few steel parts.

Another method is to apply a small trickle current to the brass parts (cathode) from an inert anode. This usually only takes a few seconds to initiate the plating on the brass parts.

Bath controls

The basics are always important and even the best chemistry requires good controls in place. Temperature, pH and agitation are the main parameters to keep in range for proper operation of an EN bath.

- **Temperature:** Most EN baths run best around 185-195°F (85-90°C) for optimal plating. If the temperature is too low, the reaction won't start; too high, and the bath can break down prematurely.
- **pH:** Routine pH checks are essential as EN baths require a narrow pH range to maintain efficient plating. A small shift in acidity can throw the bath off balance with low pH slowing plating rate and high pH potentially causing nickel hydroxide precipitation.
- **Agitation:** Often controlled by air or pump, adequate agitation of the solution is critical to help disperse heat, remove gas bubbles from the surface of the parts and enable uniform deposition.

These basic variables help foster the chemical environment that either helps or hinders plating — especially on complex parts or passive substrates.

To review, when struggling with plating initiation in an EN bath, it is common to first look at surface prep. However, more often than not, the real issue lies within the health of the bath. Examine the following variables:

- **Bath loading:** Are you in the recommended range or is there an overloading or underloading scenario at play?
- **Stability:** Identify if you have the right balance with your hypophosphite and orthophosphite levels.

Run an analysis on your stabilizer levels. Have the proper adjusters and stabilizers been added to accommodate the deposition rate relative to the number of metal turns?

- **Controls:** Double check your pH, temperature and agitation to ensure they are all in spec and operating properly.

EN baths are not generally difficult to manage — but they do require controlled loading, analysis and replenishment, and attention to key parameters. By understanding how these factors impact the operation and efficiency of the chemistry, shops can maintain a healthy bath, eliminate initiation problems and deliver a consistent, quality finish. For optimal efficiency, partner closely with your supplier to ensure the EN bath is tailored to your operation's unique needs. ■■



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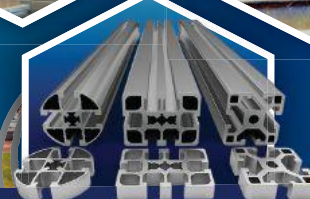


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