

ENFINITYtm

ESTABLISHING NEW STANDARDS IN ELECTROLESS NICKEL QUALITY

The ENFINITY Process establishes a new standard for Electroless Nickel Performance, Quality and Productivity. ENFINITY Provides:

Significantly improved Deposit Quality - ENFINITY deposits are consistently low in stress and porosity when compared to other electroless processes.

Elimination of Spent Solution Treatment and Disposal - ENFINITY solutions can be operated for several years and for hundreds of metal turnovers before disposal.

Reduction of undesirable process conditions - ENFINITY solutions operate without sodium or sulfate ions and through continuous treatment maintain the orthophosphite concentration constant.

Overall Savings in Electroless Nickel - ENFINITY System improves overall performance and lowers cost by improving the quality and productivity of the electroless plating operation.



Figure 1, PU2

For over forty years Stapleton Technologies has endeavored to advance products that meet the needs of industry and provide a high level of value. ENFINITY extends electroless nickel processing to new levels and delivers electroless nickel performance.

Call today for more information on how ENFINITY can improve your Electroless Nickel Operations.

ELECTROLESS NICKEL PROCESS

This document describes the basics of ENFINITY plating process. A complete document has been prepared which describes all aspects of this technology and is available from STAPLETON TECHNOLOGIES.

ENFINITY CHEMISTRY

The ENFINITY chemistry is significantly different from conventional process chemistry in a number of ways. The first difference is the elimination of Sodium salts. A second difference is the elimination of Sulfate from the process. The third difference is the continuous removal of ortho-phosphite by precipitation and filtration.

Together these elements provide a significant improvement in process chemistry by keeping the solution at a near new condition for several hundred metal turnovers and eventually obtain 8,000 MTOs under the proper conditions.

In the figure below, the ENFINITY Plating Process is operating in a conventional EN plating tank. When a 5% addition of Nickel is required, the plater presses a button on the purification unit and automatically the replenishment sequence is started. The purification unit pumps 5% of the working solution volume called REMOVAL to a reactor tank for cooling and measurement. As soon as this step is complete another pump moves the treated solution called RECOVERY back into the plating tank. The REMOVAL is then cooled and batch processed, removing the ortho-phosphite and made ready to return to the plating tank at the next replenishment. Automatically the purification unit meters into the ENFINITY process the correct amount of ENFINITY MAINTENANCE chemicals.

The removed ortho-phosphite is rinsed and passes the TCLP test for nickel metal making it possible to recycle as a non-hazardous waste under proper conditions. The quantity of filter cake generated will nearly equal the amount of hypophosphite consumed.

This balanced system provides for a constant pH, constant ortho-phosphite, constant organic acid complexor, constant nickel and hypophosphite ions and yields high quality through consistent stress, rate, phosphorus alloy and corrosion performance.

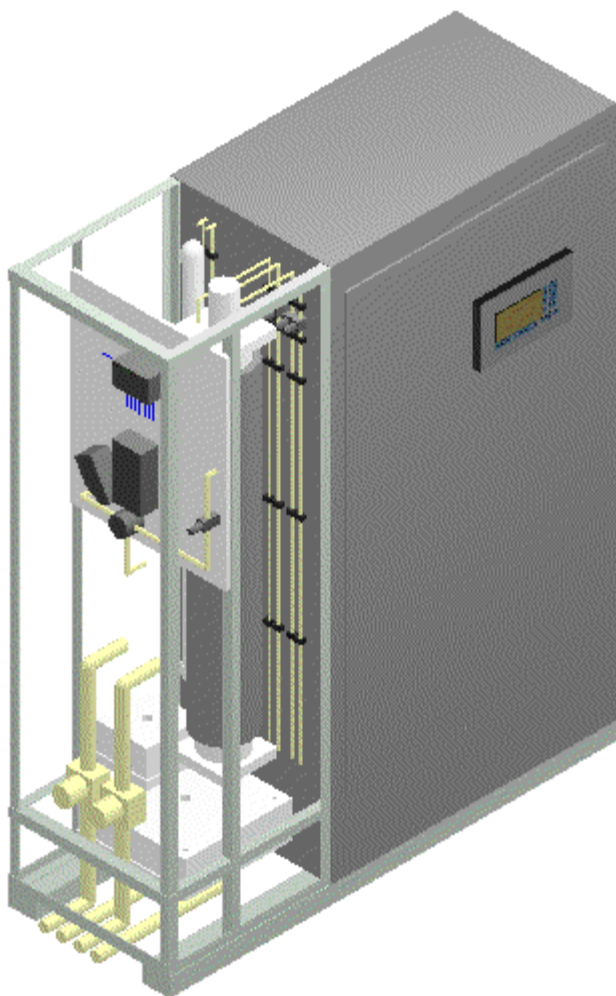


Figure 2, PU3

reactor. Purifier is added continuously using a PID control to maintain the pH at exactly the right point to remove all the ortho-phosphite from the process. The PU3 is designed for processing ENFINITY solutions ranging in volume from 100 to 2000 gallons.

The process can conveniently be operated manually in a laboratory scale up to about 20 gallons. Beyond this volume a larger vacuum or pressure filter is required. Two models are available from Stapleton to treat ENFINITY .

ENFINITY PU2 *Purification Unit*

This unit is a semi-automatic treatment unit for the ENFINITY process. The unit is designed for smaller ENFINITY process ranging in volume from 50 to 500 gallons. The PU2 unit removes, purifies, returns and replenishes the ENFINITY plating solutions. The PU2 requires more manual attention than the PU3 systems and is ideally suited for operations where dependence on human intervention.

ENFINITY PU3 *Purification Unit*

This unit represents the latest development in ENFINITY purification equipment. The unit provides continuous treatment of a heal of solution in a 25 liter

ENFINITY ECONOMICS

The ENFINITY Process is cost competitive with conventional Electroless Nickel Processes with a \$2.63/mil ft² chemical cost. From this number you must subtract the other cost drivers to identify the overall savings.

ENFINITY Process Cost		\$2.63/mil ft ²
Waste Treatment and Disposal	\$0.29/mil ft ²	
Loss of Adhesion on Aluminum	\$0.15/mil ft ²	
Rinsing and Staining rejects	\$0.08/mil ft ²	
Premature solution contamination (Fe, Zn, Pb, Cd, ...)	\$0.15/mil ft ²	
Savings Sub Total	\$0.67/mil ft ²	
Adjusted ENFINITY Costs of Plating		\$1.95/mil ft ²
Equipment Cost		\$0.02/mil ft ²
Total Cost to Operate		\$1.97/mil ft²

PROCESS SUPPLIES

There are several unique features of the ENFINITY process chemistry which distinguish it from other electroless nickel processes. The following list of chemicals and supplies are used in the process:

ENFINITY MAKE-UP This material is used to make-up the plating solution. There are four formulas which produce different deposit properties. (see page 5)

ENFINITY MAINTENANCE For each formulation there is a Maintenance chemistry. This material contains the replenisher chemistry and control additives.

ENFINITY CONTROL This material contains the unique personality of each process. The material is highly concentrated and can be added at various ratios to the ENFINITY MAINTENANCE to adjust the stability and replace the dragout. The ENFINITY CONTROL is available in four different formulas.

ENFINITY PURIFIER This material is used by the purification units to treat the removed solution for ortho-phosphite before it is returned to the operating process.

DELIVERY of EQUIPMENT

Manufacturing of the purification units, PU2 and PU3, requires about 14 weeks. As the units approach completion and are tested the customer is notified and an installation date is established. During the manufacture phase the services are installed and made ready for the purification unit.

ENFINITY SELECTION GUIDE

PROCESS P%	HARDNESS	FINISH	RATE	SALT SPRAY
MX 8-10	490 - 510	semi-bright	0.8-1.2 mils/hr	240 hr
MB 8-10	510 - 530	bright	0.8-1.2 mils/hr	240 hr
HB 10-12	460 - 490	bright	0.3-0.4 mils/hr	1000 hr+
HX 10-12	430 - 460	semi-bright	0.3-0.4 mils/hr	1000 hr+

STAPLETON TECHNOLOGIES

BRINGING STATE OF THE ART

ELECTROLESS NICKEL TO THE WORLD

For more information contact STAPLETON TECHNOLOGIES,

(800) 266-0541