# Plater Tries New Bright Nickel Plating System

## This kind of nickel plating system was not "normal" procedure for this conservative, Midwest plating shop, but it soon found its place...

By Beverly A. Graves
Editor

The Midwest tends to be conservative, as does one of its largest cities, St. Louis, Missouri. Fin-Clair Corporation, St. Louis, fits right in. "We are not a company that volunteers to be the 'guinea pig' for new products," stated General Manager Pat Gleason. However, that does not mean that the company is not willing to try new processes or improve its products.

Fin-Clair is one of a growing number of platers that also does powder coating. It also provides zinc and nickel-chromium plating at two facilities. The company's Knoxville, Tennessee facility, which runs nickel-chromium on two automated hoist lines, had been testing various bright-nickel plating systems. "We run what should be the perfect system, since we run at higher-than-normal current densities; 50 to 60 asf," noted Mr. Gleason.

The Knoxville facility is smaller than the facility in St. Louis. It plates seat belt assemblies, nearly 40 million a year. It was here that Fin-Clair tested four bright nickel PPS and index-based plating baths. PPS-type systems provide good leveling and extremely bright deposits at minimal deposit thickness. Index baths tend to provide less leveling but improved low-current-density performance and consistent physical properties. Each one started out working perfectly, but eventually ran into problems. "I anticipated the problems," Mr. Gleason stated. "We run a total reclaim on the bath. Rinses flow right back into the tank. There is no evaporation or ion exchange, and we do not have any dragout. Also, PPS-based brightener systems commonly have problems with buildup of degradation products."

Each system the company tried would also suffer from a buildup of inorganic products, such as chloride. The plating became irregular. "It was disappointing," noted Mr. Gleason. "We really liked the brightness and ductility of the PPS bath,

but we kept having problems with inconsistent plating."

The principal ingredient of a PPS solution is a type of pyridine derivative. The solution may contain a small amount of pyridine, but this is incidental to the performance of the process. PPS solutions provide excellent leveling and brightness in high and intermediate current densities. The deposits also have excellent ductility and chromium receptivity.

However, as PPS baths age, performance deteriorates and extra additives are required to maintain high leveling. Buildup of degradation products causes a loss of ductility and an overall reduction of leveling and brightness. The breakdown products are difficult to remove and may render the system inoperable.

Soon Mr. Gleason came across still another bright nickel plating system, however, this system was a non-PPS, non-index system that was low chloride. The Enthone-OMI Ultra-Lite 2000 bright nickel plating system was installed in the duplex nickel/chrome hoist line in the St. Louis facility and run fro several months. Pleased with the results, the company installed the process in one its Knoxville, Tennessee plating lines. Because of the excellent performance, the process was installed on the second line in Knoxville.

The two main reasons for the conversion were the deposit's low stress and excellent ductility. One of Fin-Clair's customers manufactures wheelchairs and is quite particular about its parts. The company puts a 100-deg bend on parts after plating and cannot afford to have any nickel peel or crack. "You can bend these pieces until they break and nothing happens; no cracking or chipping," stated Mr. Gleason. "The deposit is like molten butter."

The process is designed for an air-agitated rack plating operations. The deposits have excellent chromium receptivity and low internal stress. The system also plates bright in low-current-density areas. This makes it ideal for plating complex-shaped parts such as some of the wheelchair pieces and seat belt assemblies Fin-Clair finishes.

The H-shaped plating line at the St. Louis facility is used to rack plate both chloride zinc and bright nickel. The same soak, electrocleaners and rinses are used on parts that will be zinc and nickel plated. Once cleaning is complete, parts enter a transfer tank where a hoist picks up the rack and takes the parts through zinc or nickel plating. Zinc and nickel are never run at the same time to avoid contamination.

The duplex bright nickel line has four semi-bright nickel stations and three bright nickel stations and one trivalent chromium tank. Rinses before and after the nickel and chromium plating tanks are DI water, generated from wastewater treatment. Other rinses are fresh water. Exit sprays are used on most of the rinses to reduce dragout. After the final DI rinse, parts are dried using a forced hot-air dryer.

The plating bath is easy to maintain, according to Mr. Gleason. The maintenance additive works in con-

junction with the carrier to provide a uniform bright deposit. It is best controlled by direct observation of the work. Tank controls regulate temperature and pH. Brightener is automatically added to the bath. The carrier promotes the overall uniformity of the deposit as well as improving ductility and reducing internal stress.

"The only items we add above and beyond the maintenance and the carrier is the wetting agent, all of which are based on analysis," said Mr. Gleason. "At first we were using quite a bit of carrier, but the supplier added some of the active ingredient to the maintenance brightener, so now we add minor doses." The wetting agent lowers the surface tension and provides limited detergent action in the nickel solution for pit-free deposits.

Another reason for the switch to the non-PPS, non-indexing nickel system was that there was no contaminant buildup in the bath. This allowed Fin-Clair to "close-the-loop" on its plating line. Rinses go to a holding tank in the waste treatment area and are then run through a vacuum distillation unit designed and built by Fin-Clair. All equipment at Fin-Clair was designed from the ground up by company president and owner, Robert Mueller.

The nickel concentrate is pumped from the bottom of the unit and then through heavy carbon filtration. It is then available to the supervisors when they need to make additions to the plating tank. The distilled water is used in the rinses. The last time Fin-Clair sent anything to landfill was back in 1985 when it landfilled 800 lb.

Although conservative, Fin-Clair does not lag behind. When it comes to trying promising new products or implementing commonsense strategies for dealing with pollution prevention, it is on the leading edge. **PF**

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**1. H-SHAPED LINE is used to plate both nickel-chrome and zinc.**

**2.**

**PARTS PLATED with non-PPS, non-indexing nickel system**

**3.**

**AUTOMATED hoist transports parts through the bright nickel plating process**

**4.**

**VACUUM distillation unit designed and built by Fin-Clair**

## TABLE I--Bright Nickel Plating Process Solution Composition

| | Optimum | Range |
|---|---|---|
| Nickel sulfate | 40 oz/gal | 30 to 50 oz/gal |
| Nickel chloride | 8 oz/gal | 6 to 10 oz/gal |
| Boric acid | 6 oz/gal | 5 to 7 oz/gal |
| Carrier | 3 pct | 2.5 to 4 pct by vol. |
| Maintenance | variable | 0.125 to 0.5 pct |
| Wetting Agent | 0.25 pct | 0.1 to 0.5 pct |

## TABLE II--Bright Nickel Plating Process Operating Parameters

| | Optimum | Range |
|---|---|---|
| pH | 4.2 | 3.6 to 4.5 |
| Temperature | 145F | 125 to 150F |
| Cathode Current Den. | Variable | 20 to 60 asf |
| Tank voltage | Variable | 6 to 12 volts |
| Filtration | continuous carbon 0.5 to 1.5 lb/gal | |