FOCUS: Electroless Nickel Job Plater Keeps EN Plating Quality High

Bath and process control are key to quality for this New Jersey plater . . .

hen your plating operation services a large spectrum of industries, not only do you have to be versatile, you have to be good. Paramount Metal Finishing Co., Linden, New Jersey, prides itself on the quality of its work, its state-ofthe-art technology and its full-service plating operation.

Michael Fuschetti, vice president of operations, describes the finishing company as "a large job shop operation that emphasizes bath and process control as the most important aspects of running a high-quality electroless nickel operation." The company plates medical equipment, machine parts, electronic component packages, connector shells, computer components and aerospace parts.

A variety of substrates are plated on the four electroless nickel (EN) lines, using both racks and barrels. Plating on aluminum and steel alloys each represent about 40 pct of EN production. Zinc die-castings represent about 10 pct, with the remainder applied to special alloys used in the aerospace industry such as Invar, Kovar, stainless steels and coppers. Key Decision. "We had been using a variety of EN suppliers before we made the decision to increase our EN capacity," Mr. Fuschetti said. "When market demands for more costeffective electroless nickel plating and technical demands for high-, medium- and low-phosphorus electroless nickel coatings on more exotic substrates became evident, we decided to go with Fidelity Chemical Products." For the past five years Paramount has worked closely with its EN chemical supplier to tackle these difficult jobs.

Four EN Lines. To optimize production, Paramount employs four electroless nickel lines to accommodate the various shapes, sizes and substrates to be plated. The largest process line includes a 1,000-gal medium-phosphorus bath for plating aluminum alloys and other non-ferrous metals.

The line has the capability of handling parts as large as 10-by-six ft and is equipped with barrels that have a 500-lb capacity. This is the "workhorse" bath because of its economy and stability. This bath is specifically formulated to provide an easy-to-operate, seven to nine pct phosphorus electroless nickel deposit. A stabilizer system provides for consistent brightness over the life of the solution.

The high- and low-phosphorus baths are on the other lines that are equipped with fine mesh barrels and racks for critical work such as airbag components, medical instruments and electronic packages. Light metals, such as miniature zinc die-cast connectors, are run on a separate processing line with specialized cleaning cycles, strike baths and post plates. These lines contain tanks that range in size from five to 500 gal.

The high-phosphorus system has a special stabilizer and buffering system that provides an ultra-smooth, non-magnetic coating. The compressively stressed deposit features excellent corrosion and stain resistance. It resists 1,000 hrs salt spray (ASTM B-117) at one mil thickness.

The low-phosphorus bath is a compressively stressed process that provides a hard electroless nickel deposit with excellent corrosion resistance in alkaline environments. The hardness is close to that of stress-relieved hard chromium. Also, the deposit is uniform enough that post plating or grinding may be eliminated.

Working toward ISO-9002. Paramount has made a commitment to continuous quality improvement, establishing a quality system based on the ISO 9000 series. It is taking the final necessary steps to qualify under ISO 9002, and hopes to be officially certified this year.

Procedures for analysis and scheduled maintenance are strictly adhered to in all cleaning, pickling and electroless nickel plating baths. Automatic programmed processing on linear plating lines maximizes plating efficiency. On manual hoist and prototype lines, detailed travel sheets accompany all work, dictating process cycles to the line operators.

An automatic controller makes additions to the high-phosphorus bath. The controller continuously analyzes for nickel metal and pH and makes replenishments as needed. X-bar and R-charts are used with statistical process control SPC software to control chemistry within set operating parameters. Coating thickness is measured with a computerized x-ray fluorescence system.

Zinc die-casting expertise. What separates Paramount from many other finishing shops is its extensive experience with zinc die-cast parts. "This is a metal that is sometimes difficult to activate and achieve good adhesion of the nickel plate," Mr. Fuschetti noted. "We can plate this in two ways. One way is to plate it with a copper strike followed by electroless nickel. The other is to plate electroless nickel directly onto the zinc die-cast."

The alloy type determines the pretreatment method. Zinc die-castings are used extensively in fiber optic connector shells for the communications industry where it has replaced conventional ferrous machine parts. "The reason for this," Mr. Fuschetti said, "is because it is a more cost-

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effective approach. The electroless nickel provides an excellent barrier to corrosion while being able to deposit uniformly on complex-shaped parts.

Another forte of the company is its work with aluminum. "This was considered a tricky material to plate," Mr. Fuschetti explained. "We do not consider it tricky any longer." Today the technology is there that dispels that belief. Forty pct of the company's work is aluminum. A few years ago it was only 10 pct.

According to Mr. Fuschetti, Paramount provides three main finishes, electroless nickel, tin alloys and zinc and zinc alloys, which represent 90 pct of the company's plating business. In addition, they perform robotic painting, powder coating, screen printing and assembly operations.

Paramount has developed a versatile, full-service plating operation that stresses excellent results and fast, cost-effective work even with difficult projects. And they back it up with a warranty on their work. **PF**

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High-, medium- and low-phosphorous electroless nickel Circle 287

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Captions:

1.

MICHAEL FUSCHETTI, vice president of operations, inspects a rack of parts prior to plating.

2.

HIGH-PHOSPHORUS EN plating line has fine mesh barrels for critical plating work.

3.

PARTS ARE RANDOMLY checked for proper coating thickness.

TABLE I—Operating Conditions for Low-Phosphorous EN

Parameter	Range oz/gal g/liter		Optimum oz/gal g/liter	
Nickel Metal Content	0.64-0.8	4.8-6	0.72	5.4
Sodium Hypophospite	3.2-4.5	24-34	3.7	28
Temperature F	180-120		190	
рН	6.0-6.6		6.2	
Loading (sq ft/gal)	0.1-1.0		0.5	
Plating rate (mils/hr)	0.5-0.8		0.6	
Agitation	Continuous			
Filtration	Continuous five micron or smaller, six solution turnovers per hr			

TABLE II—Operating Conditions for Medium-Phosphorous EN

Parameter	Range oz/gal g/liter		Optimum oz/gal g/liter	
Nickel Metal Content	0.64-0.84	4.8-6.4	0.80	6.0
Sodium Hypophospite	3.2-4.2	24-34	4.0	30
Temperature F	180-205		190	
рH	4.6-5.2		4.9	
Loading (sq ft/gal)	0.1-1.0		0.5	
Plating rate (mils/hr)	0.6-0.9		0.8	
Agitation	Continuous			
Filtration	Continuous three to five micron or smaller, six solution turnovers per hr			

TABLE III—Operating Conditions for High-Phosphorous EN

Parameter	Range oz/gal	e g/liter	Optim oz/gal	um g/liter	
Nickel Metal Content	0.65-0.85	4.8-6.4	0.80	6.0	
Sodium Hypophospite	3.2-4.5	24-34	4.0	30	
Temperature F	180-20	180-200		190	
рН	4.4-5.2		4.9	4.9	
Loading (sq ft/gal)	0.1-1.	0.1-1.0 0.6		6	
Plating rate (mils/hr)	0.4-0.	0.4-0.6 0.5		j	
Agitation	Continuous				
Filtration	Continuous fi turnovers per	Continuous five micron or smaller, six solution turnovers per hr			