FILTRATION OF NICKEL SOLUTIONS

FILTRATION

Solids can be removed from the nickel bath by recirculating the solution through a filter. The filter should employ filter media with an average particle retention of 15 micron down to sub-micron with, or without, filter aid. Coarser or slightly denser media may be used, depending upon the dirt load and degree of clarity required. With a higher flow rate, a coarser filter media will attain the same degree of clarity as a denser media at a lower flow rate. The coarser cartridge has higher dirt holding capacity and longer life.

Flow rates per hour will also vary from two to ten times the volume of the tank. One tank turnover per hour is not sufficient in most cases to remove all the solids in suspension before they settle to the bottom. Sedimentation in the plating tank requires periodic cleaning and downtime of the tank.

PROPER FILTER CARTRIDGE SELECTION

Filter media of cotton or polypropylene fibers can be used on most nickel baths. Cotton would be preferred on sulfamate solutions, and polypropylene on high chloride and fluoborate baths. Polypropylene fibers on a polypropylene core are the most universal cartridge materials because of their suitability for all nickel solutions and also for their resistance to acid used to dissolve accumulated iron precipitate from the media. This can be done by flushing with hydrochloric acid (can be spent acid from other operations) or by acid soaking the cartridges off-line while using an alternate set of cartridges in the filter chamber. In this way, one set is always ready for reuse in the filter. Be sure to flush any new synthetic fiber cartridges by running warm water through the filter just prior to using, to remove the slight organic residue which is left from the winding process.

LOW COST OPERATION

Because of the principle of depth construction, each string wound 2½" diameter x 10" long filter cartridge can hold as much dirt as would collect on 3½ sq. ft. of surface media of the same density. When sized on the basis of two cartridges for each 100 gallons of solution, the filter will usually operate for six to eight 40 hour work weeks before filter cartridge replacement is necessary. Very little labor is required to replace the filter cartridges and the solution loss should be at a minimum. On a 1,000 gallon tank based on the use of 24 cartridges at $2.02 each plus $6.00 for labor, divided by 6 weeks of "unattended" operation, the filtration cost would amount to only about $9.00 per week. This will go up or down, depending upon the dirt load and the porosity of the filter cartridge used.

Where exceptionally heavy dirt loads are anticipated, such as on replating of auto bumpers where cleaning is usually incomplete or in plating of tubular items, three filter cartridges should be used per 100 gallons.

Cartridge filters may be operated with filter aid in the same manner as other surface type filters - where each cartridge is equal to ½ sq. ft. of area. In place of the cartridges, sleeves made of polypropylene may be used. Slurry tanks to assist in coating the filter cartridges with filter aid are available on some systems.

Precoated filters using two cartridges for every 100 gallons of solution will usually run for about one week before servicing is required. The operator can extend this "unattended" time by adding additional filter aid at periodic intervals through the slurry tank to help maintain a fresh porous surface on the filter media. On large systems having slurry tanks with agitation,

Nickel deposits, due to their lustrous finish, are often plated for decorative purposes in tanks suitable for rack or barrel operation. Agitation is usually recommended and organic compounds are added to get the best leveling and brightness. Other nickel solutions are used for engineering and salvage applications or electroforming, which demand a near perfect plate. These contain anti-pitting agents instead of organic brighteners. Bright and semi-bright nickel electrolytes require the continuous or periodic removal of organic breakdown products from brighteners by use of activated carbon. Carbon purification may be desirable for fresh Watts and sulfamate nickel solutions prior to the addition of wetting agents. Initial and continuous carbon treatment with at least two tank turnovers per hour are suggested. (Hull cell tests will reveal the need for batch carbon treatment or change of carbon.) The nickel-iron plating baths must be filtered and purified like any other bright nickel solution.

Electrolytic purification by "dummy" plating to remove undesirable metallic impurities, such as copper, is frequently employed in conjunction with filtration equipment by either pumping from a separate tank or weir filled with overflow solution, or by recirculating through the slurry tank for this purpose.

FILTRATION OF NICKEL SOLUTIONS (cont'd)

a slurry feed pump may be used so that some solution with filter aid is continuously added to the filter media surface (body feed). As a result, an equal mixture of solids and filter aid is maintained to keep the cake, which is forming, as porous as possible. The slurry feed pump may enable the filter to run for many weeks.

Some large rubber-lined systems, which have maximum distance between the cartridges, have been known to run for three to six months. Here again, periodic flushing with spent acid to remove precipitated iron hydroxide is possible. Often, the filter media can be rejuvenated to a like-new condition after the iron precipitate is dissolved. Large systems can be set up with valving for backwashing which can minimize the need for opening the filter. Some filters are precoated and backwashed weekly, others bi-weekly.

PURIFICATION METHODS

When powdered carbon is used in the filter, 15 micron or denser filter cartridges should be used. Filter sleeves may also be used and they are desirable because they can be washed and reused. Both cartridges and sleeves must first be precoated with filter aid to prevent migration of carbon fines from either powdered or granular carbon, and also to make it possible to clean the cartridges for reuse either by manual rinsing or backwashing.

For periodic or continuous carbon treatment on a bypass, plastic canisters containing from 1 to 14 pounds of granular carbon are efficient and easy to refill. Larger bulk carbon chambers holding 50 to 100 lbs. of carbon are also available with and without prefiltration. They contain a built-in trap filter cartridge with 3 micron retention for carbon fines. The precoated cartridge also becomes its own built-in trap filter preventing migration of filter aid and carbon into the solution. Since the cartridge is sufficiently dense to resist pressure differentials of 50-60 psi, breakthroughs are eliminated.

SUGGESTED FILTRATION SYSTEMS

Filtration systems are offered in both in-tank and out-of-tank pump and filter arrangements. Usually, solutions such as nickel sulfamate, tin-nickel or Watts nickel, which do not require continuous carbon purification, may use an in-tank pump and filter system. The standard bright nickel solutions, high chloride or other, with or without agitation, use larger, out-of-tank systems which have slurry tanks available for the convenient use of filter aid and carbon. It is always desirable, especially on larger systems, to add a slurry tank. Even though constant carbon purification may not be intended, it can be used for periodic batch carbon treatment or the addition of chemicals through the filter to the plating tank. Filter systems can also be set up so that the constant or intermittent dummying of the solution can be done in the slurry tank — if an overflow line is provided in the tank for this purpose. To make the filtration system the most functional and yet easy to operate, bypass piping, valves, slurry tank, dummy arrangement, precoat, and body feed accessories can be utilized.

Filtration systems from small laboratory sized units to full production models