Improved Method of Removing and Reclaiming Solution In Barrel Plating

By John E. Hunt, CEF

All it takes is a suction device, brush, collection tank, pump, and piping.

Improvements in bulk electroplating equipment over the last 40 to 50 years have been primarily due to new materials of construction that allow for total processing in the same barrel. This eliminates the transfer of work into and out of different plating baskets or cylinders for cleaning, pickling, and post-treatments. H also results in the implementation of automatic con*veyors* that can handle barrel as well as rack plating.

The improvements were not all good news, however, as the thickness of these materials required to give sufficient mechanical strength resulted in a considerable increase in dragout of all solutions in the process cycle. In addition, the plating barrels themselves were now being immersed in rinses, whereas formerly only the work was dumped and rinsed. The result was (and is) increased dragout because of solution retention in the barrel perforations and on the barrel itself.

Only in relatively recent times has the dragout been of major concern because it can no longer be dumped down the sewer, but must be destroyed, neutralized or otherwise removed to meet EPA effluent requirements, Consequently, the original solution costs plus those for destruction or removal make it economically advantageous to return the dragout back to the process tank.

An improved method of collecting dragout from barrel plating equipment and returning it to the process tank has been developed. It is accomplished by means of a wet/dry vacuum to provide suction, a brush or other mechanism to break the meniscus of liquid retained in the perforations, and a collection vessel with pump and piping to return solution to the original tank (Figs. 1-2).

Old-Timer's Perspective

As an old timer who has cleaned many a plating tank, getting the last bit of solution out with a scoop shovel and broom, the use of a wet/dry vacuum for this purpose made a real impression. Another innovative idea observed on an automatic nickel plating machine was the use of an air blast above the barrel at the first station after plating. It effectively and quickly removed most of the solution from the barrel but also caused considerable splattering in all directions.

The use of a vacuum under the barrel seemed an obvious improvement. Tests were conducted using a wet/dry vacuum with a special homemade brush to give the desired bristle length of approximately 3 inches. The investigation, carried out at a jobshop using hexagonal polypropylene cylinders (14 x 30 in.) on a fully automatic conveyor line plating alkaline zinc, showed an appreciable increase in collected dragout over that which normally drained from the cylinder in the same position.

The tests were made while running the same loads of parts by first collecting the drippings from the cylinder and measuring the volume. Then, using a wand arrangement, the vacuum brush was moved under the cylinder, solution was collected in the vacuum, and the total volume was again measured. Actually, to get more indicative results, a number of cylinders were processed first without the vacuum and brush to break the meniscus and then with them.

In these tests, an increase in collected volume using the vacuum was in excess of 30 percent. Furthermore, it was noted that solution was removed much faster than with normal

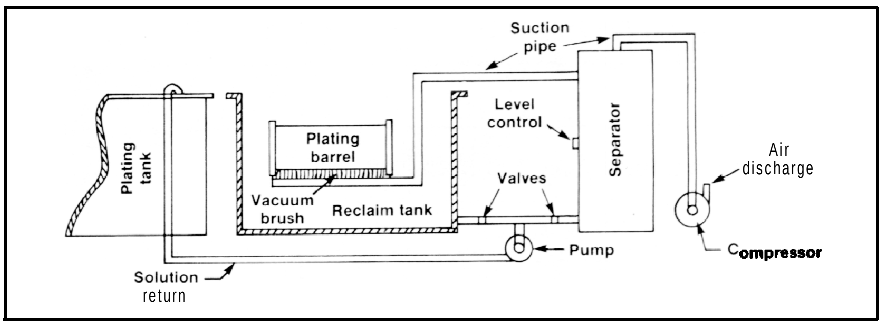


Fig. I—Wet/dry vacuum recovery system.

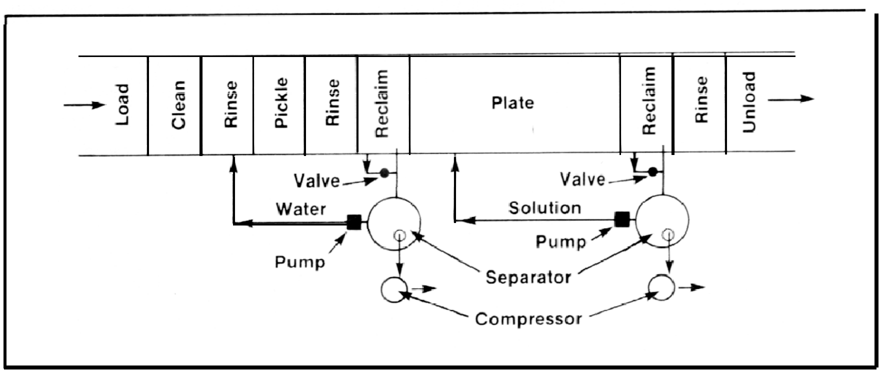


Fig. 2—Process flow diagram.

dripping. It should be noted that the cylinders were rotated in the dragout station. From a practical standpoint, the parts load would have a drastic impact on total dragout and perhaps even more so on the differential of collected dragout in a test conducted as described.

Costs and Counsel

The only item that was not available from commercial sources in running this test was the vacuum brush. The 3-in. bristle length is ideal to contact all perforated areas of the hexagonal barrel and thus break the meniscus of the solution, encouraging drainage.

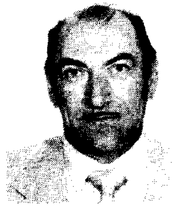
Similarly, in developing a quotation for installations of a wet/dry vacuum system for handling one station on an automatic plating machine* with barrels 14 x 30 in., all items suitable for use with alkaline cyanide zinc solution were readily available in the marketplace except for this brush. The total cost of these materials—piping, pump, valves, and wet/dry vacuum with separating tank and float valve—was under $3000 in 1981.

Most other reclaim methods such as evaporation, ion exchange, reverse osmosis, and electrolytic destruction or recovery also work with this drag out in dilute form in the rinsewater. Consequently, large volumes must be handled, involving large equipment at high costs.

The use of a drain station only, where the work and cylinder are allowed to drip for a few seconds or minutes into a reclaim tank and this drained undiluted solution eventually returned to the process tank, is generally not very effective. Unless the perforations are large, they never drain (solution is held by capillary action). The draining action is slow and may cause loss of production. The long exposure of the parts to the solution in air may stain or etch them. In addition, without a similar station just ahead of the process, there may not be room for the reclaim solution in the process tank. Also, the overly long exposure of these clean, wet parts to air in this station may require special attention to prevent surface oxidation.

As in the use of an evaporative recovery system, there is a need in most low-temperature plating processes to make room for return of the recovered solution in the plating tank. With this setup, an identical wet/dry vacuum system at the last station prior to plating is recommended. It eliminates the drag-in, which in turn allows for return of the dragout without overflowing the tank. The water may be recycled to advantage. •I

*Udylite VIP, OMI International, Warren, MI.



About the Author

John E. Hunt, CEF, a registered professional engineer, is now retired and resides at 386 Sutton Rd., Barrington, IL 60010. He received his BS degree in chemical engineering from Wayne State University and began his metal finishing career in 1939 with the Ternstedt Division of GM, where he was involved in electroplating process control, production supervision, and research. He spent many years in the supply business and co-founded a specialty vendor, Du-Tone, in 1979.