

SERFILCO® CASE HISTORY

Depth Filtration at Krueger International Increased tank turnovers with improved plating quality

Adding depth filtration to precoat filters helped Krueger International of Green Bay, WI, achieve some sparkling turnarounds in roughness plating control, maintaining plating production speed, high quality control and significantly reducing the labor cost of filter media changing.

Krueger International had a tough plating problem to deal with — nickel and chrome plating of tubular parts. The company plates approximately 2,200 chair frames per day, running three eight hour shifts, five to six days a week (seven, if needed). The material, used in the manufacture of metal furniture, was not cleaned prior to arriving in the plating department; it came straight from the bending and forming operation.

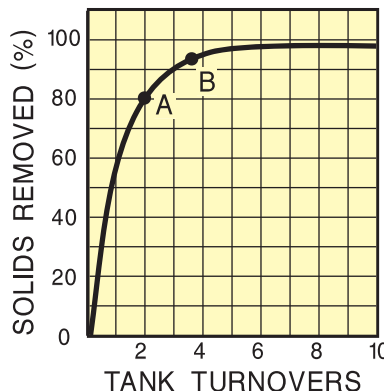
As engineering modified their filtration setup to accommodate production changes, they found that the precoat filters would not give enough filtration capacity on the bright and semi-bright nickel tanks to keep up with plating speed. They could only get one and two tank turnover per hour, not enough to control roughness. To increase tank turnovers, they decided to go to depth filtration for the economy of higher flow rates per dollar invested and the labor savings from less frequent filter changes.

To get the additional filtering capacity needed, Krueger International added a 6,000 GPH SERFILCO Sentry depth filter to the 4,500 gallon bright and semi-bright plating tanks, backing up their 4,500 GPH precoat filters. Each Sentry filter is loaded with seventeen 30 inch 25 micron depth cartridges with polypropylene fibers wound on a polypropylene core.

TANK TURNOVER

The increased filtering capacity on the semi-bright nickel bath of 15,000 GPH immediately enabled the company to increase tank turnovers from two to three per hour (15,000 gal. filtering capacity divided by tank size of 4,500 gal. equals 3.3 tank turnovers per hour). The bright nickel bath increased 3 from one to two turnovers per hour.

Krueger International engineering's objective was to improve plating quality on an order consistent with cost. To improve plating quality beyond a certain point would not have been economical, because the curve tends to flatten on the high end. Beyond this point, there is a diminishing return effect; increased tank turnovers would not produce a corresponding increase in plating quality.



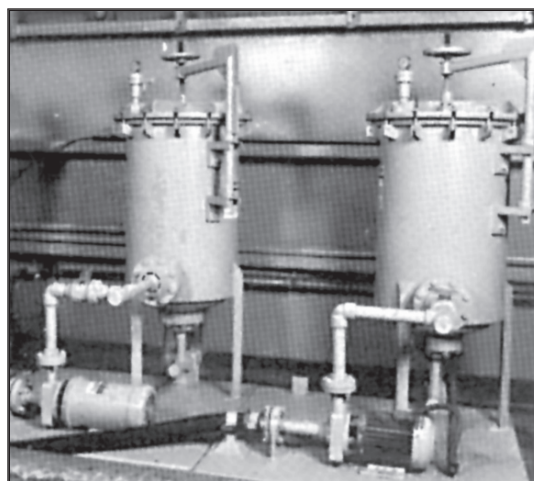
At Krueger International, solids removal went from point **A** at 2 tank turnovers per hour to point **B** at 3.3 tank turnovers per hour. Solids removal went from 80 to over 95 percent.

With the addition of the Sentry units, Krueger International's plating department has consistently achieved as low as one complaint for every half million product plated.

REDUCED LABOR COSTS

The labor cost to change filter media was markedly reduced. Before the addition of depth filtration, the two precoat filters required a media change every two weeks, on a schedule of one filter per week on an alternating basis. The time required to do this was four man-hours.

The depth filters last six to eight weeks and, because they trap particulate matter so effectively, the precoat filters also got longer service between media changes — the same six to eight weeks. At media change time, it required the same four man-hours to change the precoat filter media, but only one hour to re-cartridge the depth units.



Depth filters increase semi-bright and bright plating quality at Krueger International.

Thus, using an arbitrary seven-week change interval as an example, Krueger International spent 11 man-hours every seven weeks compared to four man-hours every week for media changes, a savings in labor that can easily be translated into dollars by any plater.

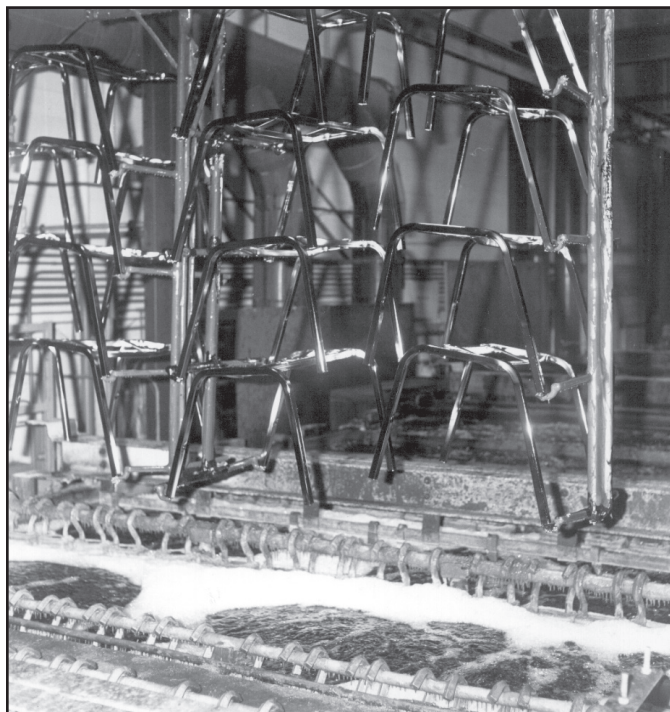
An additional advantage to the depth filters was no solution loss. The depth units had a removable top lid, and spent cartridges were removed and fresh ones installed from the top.

Filters were changed according to pressure: when system pressure built up to 40 PSI (277 kPa), the media was changed. Krueger International didn't delay making the media changes. Plating quality drops very rapidly if you don't change as soon as that point is reached.

PRODUCT VARIETY

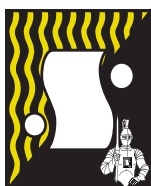
Krueger International is currently the seventh largest contract furniture manufacturer in the U.S. and a fast growing leader in the technology market segment. In addition to the technology market segment, Krueger International has shown success in several other core markets. The company dominates the college and university markets and should become the number one supplier to the education market in 2000. Krueger International holds eight multiple award contracts through the federal GSA program, making it the number two supplier to the federal government in office furniture sales. Krueger International is also expanding its presence in the healthcare market with furniture from two of its recent acquisitions, AGI and ADD.

Krueger International is determined to continue providing the best, most flexible manufacturing capacity in the industry. The company's cellular manufacturing environment includes self-directed work teams operating in an open environment of trust. This practice has resulted in an outstanding work ethic and pride of ownership in each product.



Tubular work over nickel plating tank.

Krueger International boldly pursues the highest degree of excellence in the design process of durable products, in the manufacturing processes for consistent, on-time delivery of products that meet the demands of customer specifications and in information processes through customer service. The company is among an elite group of U.S. manufacturers who have acquired ISO 9000 certification. Throughout its U.S. and Canadian facilities, Krueger International has also integrated Kaizen — a Japanese practice in the relentless quest to find a better way for higher quality, shorter cycle times and faster response; in short, the daily pursuit of perfection.



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