Nitric Acid Pickling Bath Recovery
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Gerlin Inc., located in Carol Stream, IL manufactures stainless steel pipe fittings and flanges. As part of Gerlin's process, stainless steel parts undergo a pickling bath step to provide the parts the required surface quality.

Gerlin maintains a 1,500 gallon pickling bath using nitric acid and ammonium bifluoride. The bath becomes depleted in 6-8 weeks and is recharged seven times per year. Gerlin's waste disposal costs run $18,000 per year and fresh chemical make-up costs are $13,000 per year.

Besides becoming depleted, the pickling process is also a bottleneck in Gerlin's operation. During the 6-8 week cycle, pickling times can range from 30 minutes to 6 hours. Often, even after 6 hours of pickling, hand cleaning and repickling were required.

Illinois Sustainable Technology Center engineers developed a pilot project using diffusion dialysis acid recovery technology to assist Gerlin.

A pilot scale diffusion dialysis unit rated at 5-gallons per day was used for this project.

Diffusion dialysis employs a highly acid selective membrane to split the contaminant wastestream into two, a purified acid stream and a metal reject stream. Acid recovery rates of 80 percent and metals reject rates of 90 percent can be achieved.

The Gerlin pilot project proved to be very successful. The diffusion dialysis unit recovered 86 percent of the nitric acid and 30 percent of the ammonium bifluoride. The unit also rejected 88 percent of the iron, 89 percent of the chromium, and 80 percent of the nickel.

Implementation of diffusion dialysis will increase Gerlin's productivity as a result of reduced down time, reduced pickling time and reduced rework. These factors were the company's foremost decision to implement the technology.

Additionally, implementing diffusion dialysis at Gerlin will reduce pickling bath discharges from seven times per year to twice per year, providing a savings of more than $10,000 per year.

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