

Membrane Filtration Technology

Waste Reduction in Metal Parts Cleaning

So, What's the Big Deal?

Well, the big deal is a technology that can quite possibly save you money, improve quality, increase your productivity, and dramatically reduce the amount of waste chemicals generated in your cleaning processes.

Membrane filtration is a technology utilizing "smart filters" capable of separating contaminants from clean detergent. The crux of the technology lies in the ability of these filters to separate molecules on the basis of differences in their sizes, shapes, and charges. Membrane filtration is actually a whole array of techniques, including nanofiltration, multiple membrane filtration, reverse osmosis, microfiltration, and ultrafiltration. Basically, the names refer to different sized pores in the membrane filters.

While simple in concept, successful implementation of membrane filtration hinges upon selection of the right filter material, and on choosing operating conditions to minimize the plugging of the filters. Illinois Sustainable Technology Center (ISTC) engineers can provide this kind of evaluation.

Dumping the Baby with the Bathwater?

Aqueous cleaners are fast replacing solvents for washing and degreasing parts. If you are currently using an aqueous cleaner, you are certainly aware that these solutions get contaminated with dirt and oil, limiting their cleaning capability. Periodic dumping and replacement of the cleaning solution is required. But, with the contaminated bathwater, you are also dumping huge quantities of valuable detergents, water, and other chemicals. In many instances dirty baths can be cleaned, chemicals recovered for reuse, and in the process, aqueous waste can be cut by as much as 99% or more. Sound too good to be true? R.B. White, Radio Flyer and Eco Finish are all Illinois companies that will tell you it can happen. ISTC's technical assistance program has helped dozens of companies with membrane filtration applications, and they might be able to do the same for you.

The R.B. White Story

R.B. White, a metal fabricator in Bloomington, had been using a phosphatizing/degreasing bath at its facility for several years. Extended use resulted in the buildup of dirt and oil in the bath, compromising product quality. Oil skimmers were only partially effective at removing the buildup. The bath had to be dumped every three or four months, with the replacement process requiring a full day of lost production time, and disposal costs approaching \$15,000 a year.

ISTC engineers and chemists discovered that the dump water contained less than 1% oil and grease. The remaining 99% was composed of valuable chemicals and water. Center staff reasoned that if a method could be found to separate the valuable chemicals from the contaminants, both chemical and disposal costs would be drastically reduced. ISTC engineers conducted bench top trials of ultrafiltration systems and followed up with pilot scale tests. ISTC chemists developed special techniques to monitor the bath quality as it was being processed. After the highly encouraging study results, a full scale system was installed at a cost of \$12,000. R.B. White operated the system for over three years without dumping the bath, and dramatically cut their chemical consumption. The company projects over \$200,000 in savings over 10 years.

The Radio Flyer Story

Radio Flyer manufactures children's wagons at their facility in Chicago. They contacted ISTC engineers regarding a waste problem associated with degreasing the wagons prior to painting operations. The degreasing operation was resulting in the discharge of approximately 6,000 gallons of spent solution to the sanitary sewer every two weeks. ISTC staff conducted a site assessment of the facility and determined that incorporating an ultrafiltration system into the degreasing process might significantly extend the life of the solution, reducing waste discharges.

ISTC engineers conducted on-site testing of an ultrafiltration unit to remove oil and grease contaminants from the cleaning solution. The quality of the degreasing solution was monitored for approximately two weeks before and two weeks after the installation. The figure below shows the impact of the ultra-filtration unit was effective at maintaining contaminant levels at less than 0.02% over the monitored period. Based on these results, Radio Flyer chose to install a permanent ultrafiltration system as an in-process recycling technique.

Radio Flyer anticipates over \$50,000 in savings each year from the reduction in chemical

use and waste disposal costs. Additionally, the waste volumes from dumping the degreasing tanks will be lowered by approximately 75%.

The Eco Finish Story

Eco Finish manufactures various metal parts using stamping and forming processes at their facility in Montgomery. Metal shaped parts are cleaned, phosphatized and painted prior to shipment to the customer. The cleaning/phosphatizing operations at the plant generated a waste water that had to be disposed. Eco Finish is not connected to municipal sewer facilities and had no practical or economical means of disposing of their spent degreasing/phosphatizing solution. Company representatives contacted ISTC engineers through the Valley Industrial Association to investigate methods for dealing with this waste stream.

ISTC designed and installed a closed-loop system using ultrafiltration membranes to continuously recycle the cleaning solution. The procedure proved to very effective and Eco Finish has now made the system a permanent part of their degreasing operation. Implementation of ultrafiltration has resulted in significant cost savings and waste water reduction. Additionally, it enabled Eco Finish to continue operating at this facility, something which might not have been possible without such an effective recycling technology.

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