

WMRC Pollution Prevention Case Studies

Coolant Recycling and Waste Water Reduction Alternatives for the Aluminum Disc Polishing Industry

A manufacturer of aluminum discs used for the production of CD-ROMs and other computer peripherals was discharging a high biological oxygen demand (BOD) effluent at a rate of 35,000 gallons/day. This waste was consuming approximately 20% of the local POTWs waste water treatment capacity. Faced with stiff penalties for grossly exceeding the BOD regulatory limits and facing possible shutdown, the company tried unsuccessfully to chemically treat the effluents. Biological treatment was too expensive and uncertain because of the presence of biocides in the effluent. The company turned to WMRC technical staff for possible answers.

The objectives were to reduce the current BOD (~4100 mg/L) to values closer to the regulatory limits and reduce the volume of wastewater discharged (~35,500 gallons per day, gpd) to sewer. WMRC personnel quickly identified the coolants and alkaline cleaners used in the grinding process as the main source of the BOD problem. Working in conjunction with the plant personnel, WMRC identified a lower BOD coolant that was also cheaper. Plant-wide substitution resulted in a BOD decrease of 70%.

Preliminary process assessment indicated an opportunity to greatly reduce chemical usage through recycling and reuse of machine coolant, alkaline cleaner, and rinse water. Therefore, membrane filtration of spent coolants and cleaners were evaluated in laboratory and pilot scale systems for effective removal of the suspended solids and other contaminants. Bench scale testing of microfiltration of spent coolants was carried out to identify appropriate membranes. Several polymeric and ceramic membranes were considered for laboratory evaluation. A ceramic membrane was chosen for evaluations based on factors such as separation efficiency, chemical stability and ease of cleaning.

A pilot membrane module equipped with a ceramic membrane with 0.1 micron pore size was used for the

on site pilot study. The initial stages of the study focused on obtaining information on membrane productivity, membrane propensity to foul, membrane cleaning, and maximum achievable coolant volume recovery for the spent coolants. The later stages of the study focused exclusively on coolant recyclability. Extensive laboratory analysis of the coolant was also carried out to determine loss of active ingredients such as surfactants. Based on these analyses, the recycled coolant was fortified with a 1% coolant concentrate. This recycled coolant proved to be equivalent to or exceeded the previous quality levels at a lower coolant concentration. This was a direct result of removing all particulates from the coolant.

WMRC identified further opportunities to cut costs by advocating recycling of the alkaline cleaners and rinse water used in the process. The result was a potential net savings of \$231,390/year; \$365,710/year for chemical savings minus \$134,400/year associated costs of operating resource recovery equipment. The estimated payback period of the suggested modifications was 1.3 years.

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