The Dynatec Difference

Significant Savings
- Waste stream reduction lowers discharge fees
- Water reuse reduces overall consumption
- Material recovery saves on processing chemicals
- Easy maintenance avoids labor costs and regulations

Technology Benefits
Membrane Separation System Using Tubular Ultrafilters (UF)
- Simple mechanical process
- Consistent high quality water
- Ability to reuse purified water
- Low operating costs
- Unattended operation
- Minimal disposal costs

Contaminants Removed
- Pigments and Dyes
- Polymers
- Machine Lubricants
- Heavy Metals

Services Provided
- Systems Design
- Equipment and Installation
- Operator Training
- Maintenance Contract

RECYCLING OF SYNTHETIC MACHINE COOLANTS

The Challenge
A Fortune 500 company, using synthetic machine coolants for machining of large compressor components was faced with large disposal costs for spent coolant. The corporation has a zero sewer discharge requirement so that any industrial wastewater leaving the facility, whether meeting the local sewer discharge requirements or not, has to be transported offsite for disposal at a certified disposal facility.

The facility was disposing of spent coolant at a high annual cost.

The Solution
The company asked Dynatec to carry out treatability work to establish the practicability of recycling the machining coolant. An initial study showed that the practical application of a membrane system was possible to recycle this fluid for further use.

Machining Coolants
Conventional machining coolants, often referred to as “soluble”, actually consist of an emulsion of oil in water maintained in a stable emulsion by the use of chemical emulsifiers whereas synthetic coolants are chemicals usually in the glycol family, that are truly soluble in water. During use, the coolant becomes contaminated with tramp oil, suspended particles of both dirt and metal chips from the machining operation and bacteria. Eventually these contaminants cause the fluid to become unusable and disposal is necessary.

Ultrafiltration (UF) has the ability to separate dissolved chemicals from suspended, colloidal or particulate contaminants in an aqueous solution. The contaminants found in used synthetic machining coolants all fall into these categories.

Initial Results
The results from operation of the UF system were mixed at first. It was found that some of the coolant contained large bacteria colonies even after treatment, which should, in theory, have removed more than 99% of bacteria. pH of the treated coolant was also low resulting in poor performance. Investigations proved that the UF was removing the bacteria but regrowth was occurring very quickly. Initially, however, more than 50% of the coolant was found suitable for reuse so a program was initiated to improve the reliability of the process.

It was found that some of the coolant being removed from the machine tools for recycling was septic, low in pH and high in bacteria counts. This was true even after a relatively short time in use. Virgin coolant was then used with the same results.
A program was then initiated to control both the timing of coolant changes in each machining center and to ensure that thorough cleaning and disinfecting of each machine was carried out at each scheduled coolant change.

Any coolant found to be septic is now discarded rather than being returned for recycling.

**The Results**

These changes have resulted in success. The program now operates reliably, recycling a high proportion of the coolant. After treatment, chemical concentrations of coolant, biocide and pH are adjusted to optimum levels, water and coolant are added to make up the necessary volume and the coolant is ready for reuse.

In the first year of the program, savings from coolant purchases and disposal exceeded $55,000.

**Assistance**

Invaluable assistance in the initial stages of the program, as well as on an ongoing basis, is provided by the coolant manufacturer. Dynatec recognizes that this type of assistance is vital to the success of a coolant recycling program.

**Contract Service**

Dynatec operates this system on a Contract Service program. Dynatec provides the equipment and the labor to operate the equipment. The client pays for the service on a cents-per-gallon basis monthly. The client has signed a 5-year contract with Dynatec. In addition to the monthly charge, the client also supplied space for the equipment in his facility, provides the utilities to operate the equipment and pays for disposal of the concentrated waste product.

**The Process**

The process equipment consists of a holding tank for the waste product and an oil/water separator where free oil is separated from the waste prior to introduction to the ultrafiltration system process tank. In this tank, pH is controlled if necessary by the addition of a base chemical. The waste coolant is then passed to the UF system, where the membrane retains the colloidal and suspended contaminants including emulsified oil and suspended solids, as well as bacteria. Periodically, the process tank, now containing a concentrated mixture of the contaminants, is emptied and the concentrate is disposed of to a certified waste treatment facility.

The clean fluid, or permeate, passes through the membrane and into another holding tank. Here the chemistry is adjusted, reducing the concentration of coolant by the addition of water and adjusting the concentration of biocide. pH is again checked and adjusted if necessary.