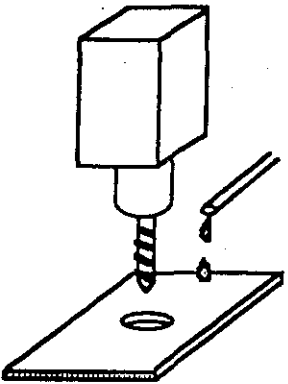


Mass Reduction

TECHNIQUES AND TECHNOLOGIES FOR SOURCE REDUCTION

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The Cool Facts On Recycling Metalworking Coolants



INTRODUCTION

Coolants are one of the most often over-looked costs in the metal working industry. Skyrocketing disposal costs and increasingly strict discharge limitations are forcing more metalworking industries to evaluate their coolant management programs. Rather than expend valuable resources on end-of-pipe treatment systems, source reduction and recycling are becoming the methods for reducing waste generation.

This fact sheet introduces basic techniques for extending coolant life while decreasing waste disposal costs and environmental liability. The techniques and technologies reviewed within are applicable to any size facility and readily adaptable to each individual situation.

Common Problems Associated with Metalworking Coolants

- Lost production time and dollars due to frequent fluid replacement
- Excessive tool breakage, poor quality finish
- Growth of bacteria leading to fluid failure and offensive odor
- Uncoordinated purchasing of a variety of coolants for similar applications
- Increasingly strict discharge limits on fats, oils, and grease

Source Reduction is the Solution

- The life span of most metal working coolants can be extended two to three fold with proper management techniques.
- Removal of tramp oils, metal fines and control of bacterial growth will eliminate the majority of factors that lead to premature coolant disposal.
- Coolant can often times be recycled on site to further extend the life of fluid.

Incentives for Recycling Metalworking Fluids

- Substantial savings from reduced purchase / disposal fees
- Improved worker health and work environment
- Increased productivity due to reduced down time and tool costs
- Efficient use of minimum number of coolant types
- Reduced environmental liability

COOLANT MAINTENANCE BASICS

Remove Tramp Oils

- **Tramp oils**, floating and emulsified, are a primary food source for aerobic (which significantly degrade coolant) and anaerobic (which produce the 'Monday morning' stench) bacteria. These bacteria break down the lubricants and corrosion inhibitors in the coolant package and contribute to skin irritations.
- **Floating oils** can be skimmed from surface by either a belt or disc skimmer. Belt skimmers allow the tramp oil to be deposited directly to a drum or other container, but disc skimmers may be easier to install and maintain in areas where space is tight and fluid level changes are slight. Timers can be placed on skimmers to eliminate the need to be turned off manually.
- **Emulsified oils** (those which mix with the coolant and will not float to the surface) can only be effectively removed through the use of high-speed, disc-bowl centrifuges. To effectively break the emulsions, remove metal fines and most bacteria, coolants should be centrifuged on a regular preventative maintenance schedule.

Remove Metal Chips

- **Metal chips** from grinding, milling and other processes present the largest source of contamination to cutting fluids by fouling machining operations and serving as a site for bacterial growth.
- **Pre-screen metal fines** at the coolant entrances to work station sumps. Larger end of pipe screens can be placed at the central collection tank if coolant sumps can not be modified.

Control Bacterial Growth

- **Thoroughly clean** machines using an alkaline cleaner and remove **all** bacteria laden sludge from sumps.
- **Schedule sump pump-outs** and monitor pH and concentration to reduce the need to "shock" the coolant with biocides.
- **Centrifugation** and/or pastuerization are the preferred means to control bacteria without excessive biocide use.

Additional Considerations

- **Ion Exchange** columns should be considered in areas of particularly hard tap water to further extend the life of the fluids.
- **Refractometers** or titration kits can help maintain manufacturers recommended coolant to water ratios, simply, and inexpensively, further extending coolant life.
- **Careful selection** of a long life coolant will help extend coolant life in machine sumps that are difficult to access or in remote locations of the shop.
- **Location, size and accessibility** of coolant sumps should be considered when purchasing new equipment. External or removable sumps constructed of sheet metal with rounded corners are easiest to clean.
- **Disposal.** Coolants should not go bad during normal use if they are recycled on a regular basis. However, accidental contamination or coolants left idle over a two week shut down may require disposal. To reduce disposal costs the following options might be considered. Coolant can be run through an in house ultra-filtration unit, chemically split or evaporated.

COOLANT CASE STUDY

CENTRALIZED COOLANT SUMP

The Raymond Corporation, a medium sized machine shop in Greene, N.Y., was plagued by many typical metalworking problems:

- Operator dermatitis and monday morning odor.
- High disposal costs for spent coolants.
- Build up of tramp oils.
- Seven different coolants in one shop.

Raymond Corporation engineers designed a system to remove tramp oils and process coolant at a central location separate from the machine tools, minimizing production down time. A sump cleaner, with separate compartments for clean and dirty coolant, is brought to each machine sump where all the old coolant and debris are removed. The machine sump is then thoroughly cleaned and filled with new coolant.

After several machines are serviced, the dirty coolant in the sump cleaner is pumped to a settling tank. The coolant is then run through a coalescing unit to remove tramp oil. Clean fluid is stored in a holding tank, the waste oil is burned. Make up coolant, added to compensate for evaporative and drag out losses, is mixed with deionized water by means of an automatic mixing unit. This ensures a steady supply of properly mixed coolant. The use of deionized water insures a fluid free of mineral salts, often present in public water supplies, which can result in corrosion, gummy deposits and emulsion splitting.

The coolant recycling equipment cost under \$20,000. The use of this system has resulted in the following savings:

- \$8,000/year in purchased coolant.
- \$10,000/year in disposal costs.
- \$8,800/year in downtime.

Recycling coolant saved Raymond Corp. \$26,000 in the first year and paid for itself in 10 months.

(Reprinted with permission from Raymond Corp.)

Many of the techniques for extending the life of metalworking coolants mentioned in this fact sheet are depicted in the diagram below. If space allows, the use of a centralized recycling area in your shop will keep the production areas clear of the recycling operation. A high-speed, disc-bowl centrifuge is an important part of the recycling system since it removes oils that won't float or settle out. A pH meter connected to the centrifuge outflow will help maintain fluid quality. Finally, adding a few additional controls, it would be possible to totally automate the central coolant recycling system.

