FACT SHEET

- Are your coolants becoming rancid quickly?
- Do your employees complain about skin irritation or odors in the shop?
- Are you having a difficult time disposing of your spent coolants?
- Are your coolant replacement costs high?

If you answered yes to any of these questions, coolant maintenance may be a means of controlling these problems and reducing your coolant costs. Please note that sources for the types of equipment identified in this fact sheet are available on separate lists from MnTAP.

Cause and prevention of rancid coolant

Most coolants are typically disposed of due to bacterial growth, not the loss of a coolant’s cutting fluid properties. Tramp oil can coat the surface of the coolant and allow anaerobic (oxygen deficient) conditions to form. The anaerobic bacteria can act as a skin irritant and can produce hydrogen sulfide gas which smells like rotten eggs.

Proper coolant maintenance can prevent this bacterial growth. Coolant maintenance incorporates the following:

- Routine removal of tramp oil and metal chips/fines in the machine’s sump.
- Control of bacterial growth.
- Maintenance of the proper coolant-to-water mix and additive concentrations.

If numerous brands of coolant are being used in your shop, coolant maintenance will be hard to do. Generally, maintenance works best in shops using only one or two types of coolants. Some employee time also must be allotted for the maintenance procedure to be performed, and it must be regularly scheduled for a maintenance program to succeed.

Removal of tramp oil

A number of devices that skim tramp oil off the surface of coolants are available. Machine sumps may need to be modified to allow access for this equipment. Ideally, skimming equipment should be placed near the sump’s coolant return pump since the
pumping action will tend to draw the tramp oil toward it. If skimming equipment
cannot be placed near the pump, a simple baffle or weir system to contain the tramp
oil in an area of the sump may allow the skimmers to remove the oil in the most
effective manner. Skimming devices should run only when a sufficient volume of
tramp oil has accumulated. If they are run continuously, excessive coolant loss could
occur. Timers on the skimming devices can help assure that this does not occur and
eliminate the need to manually turn the skimmers on and off. Two types of skimmers
are shown below.

![Belt skimmer](image)

![Disc skimmer](image)

**Removal of metal chips/fines**

Metal chips and fines must be removed routinely. They not only interfere with the
coolant return pumps but also serve as sites for bacterial growth. Chips can be
prevented from entering sumps with the use of screens on coolant entrances to the
sump or over exits from the holding trays. Chips and fines also can be removed from
the sump using rakes or vacuuming equipment. For machines running steel or cast
iron stock, a magnetic separator may be the most efficient way to remove chips and
fines. For grinders, a filtration system prior to returning the coolant to the machine’s
sump may be the route to pursue.

**Control of bacterial growth**

Bacterial growth can be controlled in a variety of ways including cleaning the coolant
sump with steam or chemicals when the coolant is replaced, use of a biocide,
adjustment of the coolant’s pH, or adequate circulation of the coolant.

**Sump cleaning** - When a coolant is replaced, the machine sump should be chemically
or steam cleaned to remove any residual bacteria that may be in the sump. If this is
not done new coolant may be immediately contaminated with the same bacteria that
caused the last batch of coolant to become rancid. Unfortunately, it may be difficult
to access the machine sumps; therefore, you may need to modify existing sumps to
allow access for cleaning tools. You also may want to keep this accessibility in mind
when purchasing new machines. Studies have shown that sumps constructed out of
sheet metal with rounded corners are easier to clean.
Use of biocides - Many different biocide products are on the market. You should work with your coolant supplier to determine which biocide is required for the coolants being used and the relative risks of the chemicals. The disposal facility must be kept in mind when choosing a biocide. You may want to check with the disposal facility prior to purchasing and using any biocide product to ensure that the biocides you are considering will not limit your disposal options. Inexpensive bacteria testing kits are available that will help you determine when a biocide is necessary and ensure that excessive amounts will not be added to the coolants.

pH adjustment - A drop in the pH of the coolants can be an indicator of anaerobic bacterial growth. By controlling the pH of the coolant with a caustic soda or sodium hydroxide solution, the need for a biocide can be greatly reduced. Portable pH meters or pH paper can be purchased to help determine when adjustment is necessary. Again, you should contact the supplier of your coolant to be sure that the solution used is compatible with your coolant. You also should note the necessary safety precautions that must be followed when working with concentrated chemicals.

Coolant aeration - The concept behind aeration is to ensure that an oxygen enriched environment is maintained, thereby preventing anaerobic conditions. This may be something as simple as running the coolant through the machine's system when parts are not being machined or adding a stirring or air line to the sump to aerate the coolant.

Maintaining coolant and additive concentrations

Maintaining the proper coolant-to-water ratio is critical since coolants are designed for optimum performance at specified concentrations. Coolant that is overly dilute or concentrated may reduce tool life and result in using more coolant than necessary. The same is true for additives. Your coolant supplier should be able to assist you in determining the necessary concentrations for the type of machining done in your shop.

Refractometers are fairly inexpensive and simple devices that can provide accurate measurements of coolant concentrations. Coolant proportioning devices are also available which would enable more accurate mixing of solutions.

Other considerations

In cases where the sump is inaccessible and cannot be modified (making oil/chip removal and sump cleaning difficult) a different coolant may still provide a longer life in the same environment.

A centralized sump for several machining operations also may ease maintenance procedures and reduce the overall capital costs for maintenance-related equipment such as oil skimmers.

For further information, contact MnTAP at 612-627-4646 or 1-800-247-0015.