METALWORKING FLUID CONTROLS

Metalworking Fluid Controls

Prolonging the life of the metalworking fluid and optimizing its performance are very dependent on the control of the metalworking fluid system. This control includes maintenance of the mechanical components as well as the metalworking fluid and is as important as the selection of the proper fluid. The problems that beset metalworking fluids in central system applications are the same as those in individual machines, only the magnitude is greater. A program to accomplish this control should include the following steps.

1. Assign the responsibility for control. If a coordinated program is not established to control the system, it will result in no control. One department or one individual should be responsible for checking fluid concentration and other specified parameters and for making any additions of water, concentrate, or additives to the system. These additions should be recorded for future reference.

When a control program is not utilized, excess usage resulting in increased costs can easily occur since no one really knows the status of the system. This person or department will also be more mindful of additions, know the reason for making them, and not use concentrate or additive additions as the only means to resolve a production problem.

2. Clean the system thoroughly before charging with a fresh mix. Refer to the CIMCOOL® Tech Report, "Cleanout Procedure for Central System and Individual Machine Reservoirs" for more details. Dirt and oil can accumulate in relatively stagnant pockets or quiet areas in the central systems or individual machine. If not removed, such accumulations not only cause dirt recirculation in a fresh charge, but also provide an excellent breeding ground for bacteria. Recirculating dirt can lead to unsightly buildup on the machines and also lead to plugged coolant lines. Chip buildup in reservoirs can drastically reduce the volume of the system and deplete product ingredients. Oil will not only act as a food source for bacteria, but will also make machines dirty.

3. Maintain the concentration of the metalworking fluid at the dilution recommended for the particular operation. Dilutions are indicated on the label and in the product literature or will be recommended by a Consumable Products Division representative.

Many plants run daily concentration checks on central systems. Individual machines are usually checked on a less frequent basis. Concentration can be checked with a refractometer, a “Mini” titration kit specific to that product, or the standard laboratory titration procedure. Your Products Division representative can discuss the advantages and disadvantages of each method. Concentration can be controlled by use of premixed fluid or a proportioning system such as the CIMCOOL Mix Master. Reviewing this concentration information can indicate trends and possible problems long before they show up on the production line. Lean concentrations can lead to rust, rancidity, tool life, lubricity, and other problems. Maintaining a stronger than recommended concentration can result in foam, skin irritation, residue, increased costs, and other problems.

The fluid mix is lost from the system by both evaporation and carry-off or splashing. Depending on the type of operation, type of fluid, and part configuration and handling, the amount of mix lost by either of these means can vary. By evaporation only water is lost. By splashing or carry-off, both water and fluid concentration are lost. Therefore, each time water is added to the system, metalworking fluid concentrate should also be added at a ratio that has been selected to maintain the proper dilution in the system. This will keep product components in their proper balance and minimize any selective depletion of these components.

4. Keep the metalworking fluid free of chips and grit. This is a major factor in fluid life. Positive filters with some type of disposable media do a better job of removing small fines than settling tanks. Refer to the CIMCOOL Tech Report on "Central Filtration Systems for Cutting and Grinding" for more information on various types of filtration. On individual machines, regular cleanouts of the reservoir or sump should be utilized to keep this buildup under control. Dirt in the fluid can lead to poor finish in grinding operations and tool wear in machining. The use of fluid recycling could be a cost efficient option.

5. The quality of water used to make a metalworking fluid mix is a very important factor in performance. Most metalworking fluids are diluted for use at concentrations of 3% to 5%; they will therefore contain 97-95% water. Use water that has a low dissolved solids content. The CIMCOOL Tech Report, "The Effects of Water Impurities on Water-Based Metalworking Fluids", explains the details of water quality.

The ideal hardness of water for making a metalworking fluid mix ranges from 80 to 125 ppm. Water is said to be soft if it has a total hardness of less than 100 ppm or hard if total hardness exceeds 200 ppm. Mixes made in soft water will have a tendency to foam which should dissipate after exposure to chips, dirt, and tramp oil. Hard water causes deterioration of the lubricant system as well as scum on the machines and the central system filter or sump. High chloride and sulfate content can lead to corrosion problems. High sulfate content by itself promotes rancidity.

As a metalworking fluid mix is used, dissolved mineral content increases from the evaporation of water and the addition of makeup. Over a period of time, chloride and sulfate ions can build up and hardness problems can develop from using water that is not that hard.

6. Aerate the metalworking fluid mix by keeping it circulated. The circulation prevents the growth of anaerobic bacteria that cause offensive odors. Many central systems continually circulate even when production is not running, others utilize timers to circulate the fluid for a short time on a set schedule during any non-production hours or days. In individual machines, an air hose an be used to bubble air through the mix while the machine is not operating.

Atmospheric oxygen is detrimental to the growth of odor producing anaerobes. During circulation, oxygen enters the metalworking fluid at a maximum rate, but at a much lower rate when the system is shut down. Since oil floats bar the passage of oxygen into a metalworking fluid, keep oil leaks from the machine tools at a minimum. Remove oil before it builds up, by using skimming or centrifuging equipment.

7. Provide good chip flushing at the machines and in the trenches. If chips do not reach the filter, they deplete certain constituents of the metalworking fluid and furnish an excellent breeding ground for bacteria. It is essential that chips reach the filter in order that they might effectively be removed. Trenches, return lines, system capacity, retention time, flow rates and other design parameters must all be adequately sized to provide this good filtration. Washdown nozzles may need to be installed on the machines or in the trenches to keep the metalworking fluid moving back to the sump or filter. Check that these nozzles are set at flow rates sufficient to keep the chips moving, but not excessive which could result in foaming.

8. Employ good housekeeping practices. Foreign matter that is allowed to accumulate in a metalworking fluid has a drastic effect on its life and performance. While a good, high-quality metalworking fluid is formulated to cope with a certain amount of contamination, the greater the amount of contamination, the shorter the life and the more erratic the performance of the fluid. Avoid using reservoirs as a "garbage" disposal. Cigarette butts, food scraps, sputum, and candy wrappers, for example, inoculate the metalworking fluid with bacteria and furnish food for their growth. Refer to the CIMCOOL Tech Report on "Contamination of Metalworking Fluids", for more details. Do not dump floor cleaning solutions into the reservoir. Many contain chemicals, such as phosphates, which may contribute to skin irritation, promote the growth of odor producing microorganisms, or cause the product to foam.

9. Remove extraneous, tramp oils. Minimize the leakage of oils into the system through proper maintenance of seals and lubricity systems. If excess quantities of oils leak into the system, the metalworking fluid performance can be reduced. Lubricating and hydraulic oils contain food for bacteria. They may also blanket the fluid, excluding air, and thereby provide ideal conditions for the growth of odor producing bacteria. If allowed to build up, extraneous oil causes smoking and increases residue around the machine area. Oil removing devices such as skimmers, coalescers, oil wheels or centrifuges can be used to prevent oil buildup. The CIMCOOL Oil Wheel does an excellent job of removing tramp oil from individual machine sumps.

By following this program, it is possible to achieve improved production and long, trouble free metalworking fluid life in central systems and individual machines. Contact your local Milacron Consumable Products Division Territory Manager to discuss further the CIMCOOL Metalworking Fluid Management Concepts in more detail as it relates to your plant and operations. ■