# FOAM CONTROL

Foam is typically considered to be an undesirable property in a metalworking fluid. Since most metalworking fluids have good cleaning properties to help keep machines clean, they also foam when agitated. The quantity of foam that occurs, then, depends upon the chemical composition of a metalworking fluid product, the quality of the water used for mixing, and the degree of agitation in the system.

## Types of Foam

There are two foams: unstable and stable. Unstable foam consists of large bubbles which "break" quickly and seldom causes problems in cutting or grinding operations. Stable foam consists of small bubbles that do not "break" readily and form a dense blanket over the surface of the metalworking fluid. This type of foam results from entrainment of air in the mix because of product composition, system design or contamination. Stable foam occurs most often in poorly designed metalworking fluid systems where there is not enough retention time, turbulent free fall of the fluid, defective pumps, high velocity nozzles, etc. Of course, some foam problems, as in large Besly, Hanchett or Gardner grinders, are due to the nature of the metal removal operation.

## Foam Problems

Surface grinder operators, in particular, object to foam because it obscures their vision of the workpiece. A large amount of persistent foam overflows metalworking fluid reservoirs and creates housekeeping and safety problems. It recirculates the
suspended swarf, causing poor finishes. Suspended dirt, in turn, depletes vital metalworking fluid ingredients and contributes to other problems.

Foam interferes with the proper functioning of positive filters having cloth or paper media in central system filtration systems. Foam causes product loss when it overflows, rapid indexing with high media costs, and inefficient dirt

removal. Although foam is undesirable in most instances, there is one exception. The Hoffman flotation unit, manufactured by Hoffman Industries, requires foam to float fines to the surface where they are skimmed off by paddle wheels. However, even in this instance, the amount of foam must be controlled. This is accomplished by selecting a metalworking fluid with controlled, not excessive, foaming properties.

## Causes of and Solutions to Foam Problems

Foam, whether too much or not enough, is a problem is solvable if you can find the causes.

**Too Much Foam - Physical or Mechanical Causes**

1. Low fluid level in the reservoir - The pump intake may be sucking air and very little fluid.
2. Air leaks in the pump or piping on the intake side - Air and fluid going through the pump will come out as foam at the nozzle.
3. Not enough retention time, the time the fluid remains in the central system before being repumped to the machines, will cause foam. Either by increasing the system's size or reducing flow increases retention time.
4. Metalworking fluid nozzles are often excellent foam producers. Utilize the nozzles that allow for proper fluid application and minimal foam generation.
5. High velocity flush nozzles - Sometimes high velocity nozzles are used in the troughs of central systems to help wash swarf back to the reservoir. High volume at low velocity will do the job without producing foam.
6. Constriction at the fluid nozzle - Dirt packing can reduce the nozzle opening, contributing to foam; small diameter piping can also contribute to foam.
7. Waterfalls - Try to eliminate or minimize free falling metalworking fluid by piping outlets beneath the surface of the mix.
8. Sharp corners - Any drastic interruption of the fluid flow back to the reservoir will tend to generate foam.

9. High outlet pump pressure - If pump pressure is greater than 20 psi, foam may result. Use bypass systems or baffles to reduce the problem.

**Too Much Foam - Chemical Causes**

1. Product type - Some metalworking fluids foam more than others. Ask your metalworking fluid supplier to recommend a product that minimizes this performance problem.

2. Mix concentration - Mixes that are too rich often contribute to foam. Lean out with water to the recommended concentration.

3. Water hardness - Soft water (under 100 ppm) causes foam more readily than hard well water, for example, in emulsion and emulsifiable products. True solutions are less affected.

4. Contamination - Phosphate floor cleaners, soaps, similar chemicals and lubricating oils frequently contaminate a metalworking fluid reservoir and can produce foam. Good housekeeping is required to prevent or minimize this kind of contamination.

Foam can be a headache. Additives such as antifoams break or depress foam. Their effect, however, is temporary and what acts as an antifoam when first used may promote foam when depleted. The ultimate solution lies in the operation itself, and selection of the most suitable CIMCOOL® metalworking fluid. ■