# 7.0 CUTTING FLUID HEALTH AND SAFETY CONCERNS

The following is a brief outline of health and safety practices. For more detailed information on cutting fluid health and safety, see METALWORKING FLUIDS: Safety and Health Best Practices Manual, available from OSHA at WWW.OSHA.GOV.

## 7.1 Reducing Exposure

Limiting metalworking fluid exposure of workers is the most effective way to reduce health risks. This section discusses some steps that can be taken to reduce exposure.

### 7.11 Fluid Selection

Fluid manufacturers often provide the most valuable source of information on fluid safety. The manufacturer should be familiar with health effects associated with the fluid and can provide companies with up-to-date Material Safety Data Sheets (MSDS).

Some of the points to consider when selecting a fluid include *toxicity*, *flammability*, and *disposal*.

MSDS provide information in regards to MWF toxicity. Therefore, product MSDS should be reviewed for health effects and recommended personal protective equipment. The cost of personal protective equipment should always be figured into the cost of cutting fluids, along with potential liability for adverse health effects.

The MSDS will also provide information about flammability. Flammability is a concern with many straight oils. This information is important both for the potential hazards, and the effect it will have on disposal. Any waste with a flash point of 140 degrees F or lower is a hazardous waste and must be disposed of by a hazardous waste management company.

Finally, disposal is often a significant factor in determining which cutting fluid will work for a given application. Always refer to applicable regulations for fluid disposal or recycling. Generally the most important consideration is determining if the waste is hazardous. Check with local officials prior to disposing of any industrial process waste through a publicly owned treatment works (POTW).

### 7.12 Exposure Limits

OSHA has established two exposure limits that may apply to cutting fluids. Employees should be exposed to no more than 5mg/m3 of mineral oil mist for an 8 hour time weighted average (TWA), and no more than 15 mg/m3 for any particulate, as an 8 hour TWA.

While these are the only requirements, there are a number of sources that list recommended exposure limits. The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Hygenists (ACGIH) have both published recommended limits for metalworking fluids and mineral oils. Limits as low as 0.5 mg/m3 have been suggested [34]. Contact the appropriate agency to receive the most up-to-date figures for these limits.

### 7.13 Health Effects

Serious health problems have been associated with exposure to MWFs. These range from irritation of the skin, lungs, eyes, nose and throat to more severe conditions such as dermatitis, acne, asthma, hypersensitivity pneumonitis, irritation of the upper respiratory tract, and a variety of cancers [33]. A variety of fac-

tors, including time of exposure, pH of the fluid, presence of contaminants, and personal sensitivity can influence the severity of these problems.

Two of the most common skin disorders associated with MWF's are dermatitis and acne. These problems most often occur where skin comes in contact with MWF. This type of dermatitis is called contact dermatitis. Water based, synthetic, and semi synthetic MWFs are most likely to cause contact dermatitis. Another form of dermatitis, allergic dermatitis, can spread to areas of the skin that have not been exposed to MWF.

Repeated exposure can lead to extreme sensitivity, when small exposures that would not previously have resulted in any symptoms become more and more intense.

Respiratory problems are also a concern for people exposed to mist or vapor from MWF.

Symptoms that are frequently reported include sore throat; red, watery, itchy eyes; runny nose; nosebleeds; cough; wheezing; increased phlegm production; shortness of breath; and other cold-like symptoms.

For some people, asthma, chronic bronchitis, and hypersensitivity pneumonitis can occur. Coughing and shortness of breath are common symptoms for all of these conditions. Bronchitis may lead to coughing up phlegm, asthma is often associated with wheezing and difficulty breathing, and hypersensitivity pneumonitis may lead to flu-like symptoms [33].

Factors such as smoking increase the possibility of respiratory diseases. Cigarette smoke may worsen the respiratory effects of MWF aerosols for all employees.

## 7.14 Engineering Controls

There are a number of methods available to control the level of MWF exposure. The techniques range from simple, obvious steps like providing ventilation or collection hoods to draw mist away from operators, to more subtle techniques such as additives that reduce misting, and changing the type of metal working fluid. Isolation of the machining operation, low-pressure delivery, and controls that stop the flow of MWF's when no machining is being performed are also effective at reducing the level of exposure.

For best results, a combination of control methods should be used. For instance, ventilation will be much more effective if the vent is located near the machining surface, and the surface is isolated from the employee by a barrier of some type.

Combining low-misting fluids with low-pressure delivery systems that stop flowing when machining is not being performed can also be an effective combination to control mist exposure.

Assuring that equipment and the fluid itself are maintained can reduce the risks associated with exposure. Proper maintenance will prevent the buildup of hazardous contaminants and help reduce fluid loss [33].

Another option is dilution ventilation. This is ventilation for the entire working area, rather than ventilation that is designed to serve an area very close to the source. This is generally less effective than source ventilation, but can be easier to install and maintain. One obvious drawback is the large quantity of heated air that may be lost from a shop during the winter months.

## 7.2 Other Control Methods

In some instances, reducing the level of exposure is not possible or practical. In those cases, other techniques must be used to reduce risk.

### 7.21 Personal Protective Equipment

Although engineering controls, safe work practices, and management programs are the preferred method for dealing with potential hazards, there are times when personal protective equipment (PPE) is appropriate for reducing hazards.

OSHA's Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to evaluate the need for personal protective equipment in their workplaces, and to provide any equipment deemed necessary. The employer must also ensure that equipment is properly used and maintained (even when it is employee owned). Employee training is also required. Each affected employee must demonstrate an understanding of the training before being allowed to use PPE.

Other standards, 29 CFR 1910.133 through 1910.138, clarify and expand the requirements for specific areas such as hand protection, eye and face protection, and protective footwear.

Employers should survey the work area, examining each task for potential exposure to chemicals, projectiles, punctures, high temperatures, falling objects, and noise. The operators manuals for various equipment and MSDS should also be consulted. Any recommended protective equipment should be provided, along with the appropriate training.

Using gloves, aprons, sleeves and caps, can reduce skin contact with MWF. In some cases, such as jobs that require manual dexterity, some equipment such as gloves may not be appropriate. Employers should also consider the potential hazards that may be created by personal protective equipment. Gloves can become slippery, loose protective clothing can become caught in machinery, and heat exposure can damage some types of PPE.

Respirators are a special concern. Improperly fitting or improperly worn respirators can provide a false sense of protection, while still allowing exposure. OSHA regulations for properly equipping employees with respirators are very involved, and it would be impossible to cover them adequately here. When respirators are required, a comprehensive respiratory protection program as outlined in the OSHA respiratory protection standard (29 CFR 1910.134) must be established.

### 7.22 Establishing a Metalworking Fluid Management Program

There are many advantages to establishing a MWF management program. Most often, a management program is established as a means of tracking costs and assuring compliance with environmental regulations. However, careful fluid management can also have a positive impact on worker health and safety. Many of the negative health effects associated with metal working fluids are the result of contaminants in the fluid, rather than the fluid itself. A monitoring program helps to assure that the fluid quality and concentration is controlled, and prevents buildup of contaminants. For more information on establishing a fluid management program, see section 4.

### 7.23 Exposure Monitoring

Exposure monitoring provides a direct measurement of the exposure of workers to MWF, and can be used to assess the effectiveness of engineering controls, or identify the need for personal protective equipment. The first step in exposure monitoring is to determine if the measurement should be quantitative or qualita-

tive. A qualitative measurement will determine if exposure is occurring, without necessarily pinpointing how much exposure is taking place. This is often a first step in determining where quantitative measurements should be taken.

Qualitative measurements are generally more involved, and can be tied to a particular person, area, or source. Personal breathing samples are generally the most accurate indicators of actual exposure. The details of actual implementation vary depending on the type of monitoring, and are beyond the scope of this document. Help can often be had from insurance carriers, your local or national OSHA contacts, trade associations, or other similar industries.