SKIN IRRITATION CONSIDERATIONS IN A METALWORKING ENVIRONMENT

Dermatitis or skin irritation in a metalworking plant can arise from a number of causes, such as too strong of a fluid mix, improper use of solvents or cleaners, changes in weather, contaminated metalworking fluid, etc. As a manufacturer of metalworking fluids, Companies evaluate additives in accordance with the procedures specified in the Regulations of the Workplace Hazardous Materials Information System.

Healthy skin's first line of defense against irritation is its "barrier layer" that insulates and protects it from the environment. This barrier layer neutralizes the effect of weak acids and alkalis, wards off some forms of bacteria and most forms of fungi, while helping to regulate body temperature and providing partial control of water loss and retention. The water holding capacity of the barrier layer keeps the skin's surface soft and flexible, as well as contributes to its ability to resist chemical insult from irritating substances. The percentage of water retained in the barrier layer depends on the water supply available from within and on weather. When noticeable dryness occurs, as in the winter, this is a warning that skin may be vulnerable to irritation by forces that healthy (moist) skin repels. Immersion or contact dermatitis (dishpan hands) is the type of skin irritation most often associated with water-based metalworking fluids. It ranges from mild to severe. Mild cases are characterized by dryness, redness, and itching. Severe cases are characterized by scaling, a rash, or even swelling, cracking, and oozing. When humidity is extremely low in the late fall, winter, or early spring months, the occurrence of immersion dermatitis increases. A machinist may have had his/her hands in metalworking fluid all summer without damage, then in winter he/she suddenly gets a noticeable to severe case of dermatitis. The product has not changed, but the weather has. Dehydration of the barrier layer of the skin destroys its ability to regulate the inflow and outflow of fluids. It now absorbs water more readily than it did when healthy. For instance, when machinists, whose skin is not acclimated to a wet environment, immerse their hands in a water-based metalworking fluid all day, their skin becomes supersaturated. However, the barrier layer is unable to hold significant amounts of water for appreciable periods of time when exposed to dry air, resulting in dryness and chapping. Dry skin is inflexible and cracks easily. Foreign substances can enter these cracks and irritate the living cells of the skin, causing inflammation. This further weakens the skin's resistance to irritating materials, such as contaminants in a metalworking fluid. In addition to metalworking fluids, there are other materials encountered in the manufacturing industry which frequently cause dermatitis. These include solvents such as gasoline, kerosene, and turpentine, harsh abrasive hand cleaners, machine cleaners, and degreasing compounds.

Metalworking fluid manufacturers evaluate their products for irritating properties through extensive chemical reviews and laboratory analysis. However, they cannot control the contamination that enters during usage. Greater-than-recommended concentrations of metalworking fluids, for example 1:5 (20%) instead of 1:10 (10%), generally increase the washing action, but at the same time increase the potential for dry skin. Investigation to identify the cause of irritation is essential to solving the problem. Contrary to popular opinion, *primary skin irritation is not caused by bacteria.* Bacteria that live and multiply in metalworking fluid mixes can produce offensive odors, but they do not cause primary skin irritation. In some cases, our own skin bacteria can cause a secondary infection in irritated or damaged skin.

Prevention Pays

The Council of Occupational Health estimates that over 90 percent of occupational dermatitis is preventable. Most manufacturers have found it worthwhile to maintain an industrial hygiene program. Educating workers on the importance of good housekeeping, proper use of barrier creams, appropriate hand soaps, protective clothing, and convenient washing facilities help workers provide for their own protection. The payoff includes fewer man hours lost, greater efficiency, and increased production.

What can you do to prevent dermatitis?

1. Check the metalworking fluid concentration frequently. Either by accident or by design, metalworking fluid mixes can become very concentrated (1:5 instead of the recommended 1:10). Sometimes the concentration is increased in periods of high humidity to achieve greater corrosion control, and remains at this high concentration into the "dermatitis season". Evaporation of water from the mix or poor concentration control may also lead to highly concentrated mixes. Recommended dilution ranges are based on optimum performance of the product, whether it be tool life, corrosion control, mildness, or microbial control.
2. Recharge with fresh fluid after cleaning the out machines where excessive grit and metal fines have accumulated. When re-circulated, these accumulations can have a "sandpapering" effect on the skin, producing very small scratches and/or cuts. Also, a good cleanout and recharge eliminates built-up contamination of foreign substances.
3. Alert machinists to the importance of protecting their skin during cold, dry weather. This applies especially to those who have a history of skin irritation, or new employees who have never worked in a wet environment. They should:

    a) Avoid use of harsh abrasive soaps or solvent based waterless hand cleaners.
    b) Minimize contact with solvents and highly alkaline materials.
    c) Avoid excessive hand washing.
    d) Wear clean, dry, impervious gloves when handling fluid concentrates.
    e) Practice good, personal hygiene.

A machinist who changes between types of metalworking fluid is more susceptible to immersion dermatitis than other operators. This is especially true for chemical emulsion or solution-type products, which have a greater washing action than oils. Therefore, good hand care, particularly during the "dermatitis season", is important until the skin adjusts to the change.

If Skin Irritation Has Occurred

1. Look for clues in the shop that may point to the condition or substance that caused the dermatitis. For example, rust inhibitors, harsh cleaners, soaps, floor or machine surface cleaners, and excessive tramp oil are known to affect some workers.
2. As far as the metalworking fluid is concerned, first, check the concentration of the solution. Also, send a sample of the metalworking fluid to the supplier for examination. Analysis may shed some light on the problem.
3. Observe the skin so you can later describe its appearance for the benefit of others.
4. Find out how many workers are affected. Try to determine if they have had skin problems in the past.

Dermatitis is a problem. The machinist should immediately report it and visit the plant nurse or physician. The causative agent or agents should be identified and removed from the machinist's contact. Once this has been done, a barrier cream will protect the skin from further damage. Barrier creams prevent the skin from coming in contact with irritating substances. However, it is up to the physician to prescribe the appropriate medication and give instructions to the machinist. As mentioned earlier, various sources within the metalworking environment may cause skin irritation. We have found that the following steps are beneficial should such skin irritation occur. Although these steps have been found to have favorable results, they are not meant to be a substitute for the consultation with a physician.

Skin Treatment Cycle

Upon arriving at work, the individual should:

a) Apply a barrier cream.
b) Use only a mild soap such as (Dove) when hands and forearms need to be washed.
c) Avoid excessive hand washing. If you have any degree of skin irritation, excessive contact with water and abrasive cleaners must be avoided while maintaining good personal hygiene practices. Do not over-wash irritated skin!!
d) Minimize excess wiping of the hands throughout the day, especially with shop rags or other abrasive towels. A good, clean disposable paper towel should be used when wiping dry or irritated skin.
e) After washing hands and forearms, apply hand lotion before eating lunch.
f) After lunch, re-apply barrier cream on clean skin.
g) No operator should spray compressed air directly on his/her skin at any time.
h) At quitting time, wash hands again with mild soap and apply hand lotion or a dedicated skin cream.

During non-working hours, the individual should:

a) Continue to use mild soap.
b) Avoid skin contact with paints, solvents, fuels, or waterless hand cleaners. Prolonged or frequent contact with these types of substances is harmful to the skin and prevents healing.
c) Apply a hand lotion or medicated skin cream, before going to bed.

As a precautionary measure, the individual should seek timely medical consultation, dependent on the specific circumstances.

Please Note: If gloves are currently being used, they should be clean and dry, and their use should continue ONLY until the skin is healed. Once the skin irritation is cleared, the use of gloves should then be discontinued. Daily cleaning and thorough drying of the gloves must be conducted to prevent prolonged or exaggerated skin irritation. Glove selection is important. Please be sure the gloves are easy tear-away type gloves and are approved for use in the plant.