Health, Safety and Environmental Affairs — Dermatitis

Dermatitis is a major cause of medical "lost time" in the metalworking industry and frequently metalworking fluids (MWFs) are implicated. So, one of the first questions asked is often "Will your product cause dermatitis?" And the answer comes back, "We do everything possible to formulate and produce fluids that do not cause dermatitis. Not only are the individual components reviewed for health and safety profile, but the final product composition is classified using GHS-specific hazard criteria. In addition, final formulations are often tested by an independent third party lab to confirm the final GHS hazard classification(s). So why then are coolants so often implicated in industrial contact dermatitis? The answer seems to come back that the fluid in use is often very different than new fresh fluid, because of either improper management or contamination, or both. Additionally, it is the part of the process that is least understood; so when no other explanation is found, the coolant often is blamed.

Occupational dermatosis is a term used to describe any abnormality of the skin induced or aggravated by the work environment. Dermatitis is somewhat more specific in that it refers only to inflammation or irritation of the skin. Occupational dermatitis is dermatitis that is induced or aggravated by the work environment. There are two broad causes of dermatitis:

1. **Primary irritation** which is a result of a direct action on the skin at the site of contact, at the time of contact or shortly thereafter.
2. **Sensitization** which is the result of an allergic reaction (immune system response) to a given substance. Initial contact with the material may cause no irritation but will trigger a buildup of sensitivity to the material over a period of time. Once sensitized, even the smallest amount of the substance can result in a severe reaction which is not necessarily limited to the site of contact. Photosensitization is a sub-set of sensitization, except that the presence of light is required to activate the sensitizer.

The four basic mechanisms by which dermatitis may be induced are:

1. **Mechanical injury:** friction, pressure or trauma, including abrasion.
2. **Chemical attack**: a chemical reaction between the skin and something that it is exposed to.
3. **Physical agents:** excessive heat or cold, radiation or electricity.
4. **Biological agents:** insect bites or plants such as poison ivy, oak, and sumac.

Certain elements increase the chances for the development of dermatitis. These indirect or predisposing factors include things like race, age, sex, skin texture, perspiration characteristics, cleanliness, allergy, general health, diet and season of the year. Let’s look at each of these individually:

1. **Skin Characteristics** – Generally, light-complexioned people such as blondes and redheads have more sensitive skin than darker skinned individuals. This is due mainly to the amount and type of pigmentation in the skin, and the amount of oil found in the skin.

   Individuals with naturally dry skin may be more susceptible to the action of solvents and detergents than those with oily skin. On the other hand, those with oily skin may be more susceptible to folliculitis or acne-type conditions caused by oils and similar materials. While perspiration is one of the body's natural defense mechanisms, it can actually initiate or intensify the effect of an irritant on the skin. For example, perspiration on the hands may draw a material from glove linings that will irritate the skin; and some materials may be irritants only when in solution, such as soda ash. Therefore, those individuals who perspire excessively could be more susceptible to skin irritation of this nature.
2. **Age** – Young workers seem to develop dermatitis more frequently than veteran workers. This may be because a young worker's skin has not yet adjusted to the new work environment; while veteran workers become acclimated to the workplace and thus may have skin that is more tolerant. Additionally, "self selection" seems to be a factor – if early in your work life you find that in certain environments you are likely to be subject to dermatitis you tend to avoid these situations.
3. **Personal Health** – For genetic reasons, some people develop allergies or sensitivities to some substances. This can occur with any material and frequently manifests itself partly or wholly as a skin rash or irritation. The potential for developing allergies to metalworking fluids is comparable to that of

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the cosmetic industry: very small. General ill health can render the skin more susceptible to the causes of dermatitis. In addition, many medications have side effects that include skin reactions.

4. **Personal Cleanliness** – Both personal hygiene and cleanliness of the work environment can have significant impact on the condition of skin. Keeping skin free of potentially harmful materials is the most effective way of preventing dermatitis. Regular washing with mild soap and water and washing before eating or drinking is a very good policy. Over time, work clothing frequently becomes saturated with dirt, chips, and chemicals which can contribute to the problem. Regular changing of soiled shop rags, work clothing, and gloves is a very good practice.
5. **Climate and Environment** – Hot, humid weather usually results in increased perspiration and associated problems. Alternately, cold, dry air can cause chaffing of the skin. With a drop in relative humidity the skin tends to lose moisture. The season of the year also has a great deal to do with off-the-job exposure to a variety of non-work related issues. These may include fertilizer and herbicides for farm, lawn and garden; paint and solvent exposure when refinishing furniture; exposure to sunlight, poisonous plants, or insects while swimming, camping, and such.

In general terms, this provides a broad overview of the industrial contact dermatitis situation in the metal removal environment.

Notes:

1. While the information in this Master Fluid Solutions' Technical Bulletin is based on many years of experience with metalworking fluids, it can not and should not be substituted for the advice of a medical professional who is experienced with the issues found in the metalworking environment.
2. If you encounter a dermatitis problem and decide to change out the cutting fluid, keep several pint samples of the "used" fluid to be evaluated by your fluid supplier and/or independent laboratory, or used in subsequent patch testing by a dermatologist.

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