

DERMAL ASSESSMENT GUIDE

The Independent Lubricant Manufacturers Association’s (ILMA) Safety Health, Environmental, and Regulatory Affairs (SHERA) Committee Dermatitis Task Force prepared this guide as an ILMA and OSHA Alliance outreach project. The guide is designed primarily as a tool for managers and business owners to help them understand the possible connection between instances of employee dermatitis and facility operations that use metal removal fluids (MRF).

This guide is not intended as a primer on dermatitis for individual employees. Rather, the guide provides a framework for business owners and managers to evaluate operations in a systematic manner to uncover a possible collection of factors that may relate to instances of employee dermatitis, especially when there does not appear to be an obvious cause.

There are many aspects interacting in the metal removal environment that can raise skin irritation potential. When skin irritation occurs, it is important to investigate as many of these aspects as possible. The guide presents the topics Machining Operation Variables, Metal Removal Fluid Variables (including fluid type, concentration, system additives, and contaminants including microbiological), Engineering and Environmental Parameters, Personal Protective Equipment (PPE) and Skin Care, Employee Feedback and other Considerations in relation to skin irritation potential.

Resist the temptation to cease working through the entire guide upon arriving at a factor that “seems” to be the right one – there may be other factors contributing to the dermatitis instance.

Additionally, when using the guide, business owners and managers should be mindful of applicable state and federal requirements relating to patient privacy when talking with employees about medical care that the employee may have sought or received regarding dermatitis symptoms.

Consideration	Findings and Comments
Machining Operation Variables	
<p>Describe the machining equipment</p> <ul style="list-style-type: none"> ❑ Manufacturer, make, model, age, and machine type. ❑ Describe operator function. ❑ Older machines may not have the enclosures that reduce operator contact. ❑ High-speed and high volume operations such as grinding create more mist and increase operator contact with the fluid. ❑ Is the tool part of a line or stand-alone? 	
<p>Type of metal removal process</p> <ul style="list-style-type: none"> ❑ Examples – milling, grinding, boring, drilling, honing. ❑ Coolant mist can be generated from many types of operations, especially grinding, and can have a direct connection with skin irritation. 	

Consideration	Findings and Comments
Machining Operation Variables	
<ul style="list-style-type: none"> ❑ Machining alloys that contain nickel, chromium and cobalt increase the likelihood of skin irritation. ❑ Metal removal processes that produce fine particles can cause skin abrasion. 	
<p>MRF delivery parameters (pressure, volume, nozzle angles, flood vs. direct spray, etc.)</p> <ul style="list-style-type: none"> ❑ In general, the more pressure and volume in the system, the more spray and mists are generated. ❑ High pressures and volumes without adequate enclosures increases skin contact. ❑ Nozzle angles are important, as is the MRF return system and residence sump time as factors for mist generation. ❑ MRF processes that cause splashing onto clothing increases potential for skin irritation. 	
<p>Speeds and Feeds</p> <ul style="list-style-type: none"> ❑ In general, the faster the metal is being removed and the greater the number of revolutions on a cutting tool, the greater the amount of fluid splash and mist. ❑ High rates of metal removal can create higher amounts of mist and may increase operator contact. ❑ A generous low-pressure flow of MRF delivered to the cutting zone, where it floods and cools the workpiece and cutting tool, is normally most effective. 	
<p>Is the machining process enclosed?</p> <ul style="list-style-type: none"> ❑ Open machines can increase operator contact with the fluid. ❑ A good enclosure will prevent worker contact with the MRF by preventing splash from exiting the machine and by capturing mists. ❑ When maintenance is performed on enclosed machines, the worker can be exposed to pooling or dripping MRF that can soak clothing and increase skin contact time and area. 	
<p>Central system or individual sump? What is the sump capacity?</p> <ul style="list-style-type: none"> ❑ Small sumps can quickly develop high concentrations of MRF and/or contaminants. ❑ Large central systems may have a high level of operator contact and are subject to a large number of contamination variables. 	
<p>Is the sump equipped with filtration? What type?</p> <ul style="list-style-type: none"> ❑ Filtration and removal of chips, fines, tramp oil and other contaminants is important to properly maintain the fluid. 	

Consideration	Findings and Comments
Machining Operation Variables	
<ul style="list-style-type: none"> ❑ Small metal particles and other debris suspended in the fluid can create small cuts on the skin when the worker wipes off his/her hands and arms. 	
<p>Does the machine receive routine cleaning and the MRF get changed?</p> <ul style="list-style-type: none"> ❑ Without system cleaning, the MRF fluid will be contaminated with hydraulic oils, way oils, particles, cleaners, etc. which can interfere with the operation design of the machine, increase mist levels and thus increase dermal irritation potential. ❑ Dirty machines are an indication of dirty fluid. 	
<p>Have any recent changes occurred with the machining process? (Examples of changes include: feed/speeds, splashguards, exhaust systems, coolant delivery pressure, and delivery system design.)</p> <ul style="list-style-type: none"> ❑ Changes in cutting parameters can increase operator contact. ❑ Changes in the tooling and workpiece material can introduce new metals and finer particles that can increase irritation potential. ❑ Changes in filtration or mist collecting can increase operator contact. ❑ Changes in fluid type/source can change the irritation potential of the fluid. 	
<p>What type of tooling used?</p> <ul style="list-style-type: none"> ❑ Steel, ceramics, cast alloys, carbides? ❑ The tool affects the chips, swarf and fines. Some tooling can cause allergic reactions or dermal irritation – for example, dissolution of cobalt from tungsten-carbide tooling increases irritation potential. 	

Consideration	Findings and Comments
Metal Removal Fluid Variables	
<p>Fluid brand name and type of fluid</p> <ul style="list-style-type: none"> ❑ Straight oils, soluble oils, semi-synthetics and synthetics are the 4 major classes of MWFs available; there are many different formulations available and they all have differing potential for skin irritation. ❑ Changes in chemistry during use increase the potential for skin irritation, especially if the MRF becomes contaminated with fines, tramp oil or alkaline cleaners. 	

Consideration	Findings and Comments
Metal Removal Fluid Variables	
<p>Targeted concentration vs. actual concentration</p> <ul style="list-style-type: none"> ❑ MRF is designed for a specific dilution range, which when exceeded can increase skin irritation potential. ❑ High MRF concentration can increase mist levels and operator contact. ❑ For water-based fluids, the target concentration range is usually 5%-8% unless otherwise specified. ❑ Higher-than-target MRF concentration can cause increased fluid-related irritation. 	
<p>How is concentration determined on-site? These give only general estimates:</p> <ul style="list-style-type: none"> ❑ Refractometer readings show the concentration of all dissolved materials – not just the MRF concentration. ❑ Concentration checks should be performed daily, certainly not less than twice per week. As different fluid components decrease and increase in concentration over time, check concentration readings several ways, such as acid split and chemical titration. ❑ Recent and accurate concentration readings are key to diagnosing sources of irritation. ❑ Frequency of analysis depends on the size of the sump and history of the system's performance. 	
<p>Is there periodic lab data on the system? What are the trends?</p> <ul style="list-style-type: none"> ❑ The build-up of MRF components and contaminants over time increases potential for skin irritation. ❑ Tramp oil contamination from hydraulics, ways, gears and spindles adds to the total oil in a MRF and increases potential for skin irritation. 	
<p>Types of additives used and frequency</p> <ul style="list-style-type: none"> ❑ Additions of materials to the sump cause time-related changes in concentration that can create cycles of increase irritation. ❑ The addition of biocides and some other additives will increase the potential for skin irritation. ❑ Low levels of MRF addition indicate a replacement of tramp oil for oil in MRF, which can lead to increased skin irritation. ❑ Sump additives include defoamers, biocides, lubricity agents, hard water stabilizers, etc. ❑ MRF concentrate and additives should be introduced into sumps slowly in areas of adequate mixing to avoid pockets of high concentration. ❑ Care should be taken in the handling of concentrates and additives, as they represent a much more concentrated exposure to chemicals designed for diluted use. 	

Consideration	Findings and Comments
Metal Removal Fluid Variables	
<ul style="list-style-type: none"> ❑ Use antimicrobial pesticides (biocides) registered with the EPA ONLY according to label recommendations with careful attention to concentration and frequency. 	
<p>Is historical data concerning sump additions available?</p> <ul style="list-style-type: none"> ❑ Records should be kept of the type, manufacturer, amount, and date of material added. 	
<p>Are tramp oils or other chemical contamination present?</p> <ul style="list-style-type: none"> ❑ Some tramp oils contain additives for anti-wear that are more irritating than oils normally used in MRF formulations. ❑ Contamination from floor cleaners, parts washers, rust preventatives and many other upstream sources can become part of the fluid increasing the potential for skin irritation. ❑ Tramp oil contamination often increases mist levels and can significantly contribute to skin irritation. 	
<p>Has there been microbiological contamination?</p> <ul style="list-style-type: none"> ❑ Bacteria and fungi are not common causes for skin irritation. ❑ Microbiological material in MRFs can infect open cuts and prove harmful to persons with compromised immune systems. ❑ Microbiological activity can affect fluid performance and stability. ❑ Improper use of antimicrobials and biocides increases skin irritation potential. 	
<p>Volume and frequency of water adds. Make-up water quality.</p> <ul style="list-style-type: none"> ❑ Low frequency of water adds can indicate severe MRF concentration cycles that could increase potential for skin irritation. ❑ High water use can be a sign of concentrated water-borne contaminants. ❑ Like MRF make-up, regular small additions of water are preferred to large doses. ❑ Poor water quality (high hardness, chlorides, sulfates, etc.) can impact MRF stability leading to poorer performance and increased potential for skin irritation. 	
<p>What is the system turnover rate?</p> <ul style="list-style-type: none"> ❑ Turnover rate is the number of weeks required to replace the amount of fluid originally used to charge a system with make-up additions. 	

Consideration	Findings and Comments
Metal Removal Fluid Variables	
<ul style="list-style-type: none"> ❑ Low turnover rates can indicate detrimental tramp oil contamination. ❑ Regular small additions of MRF are preferred to large doses for maintaining a more consistent concentration of all components. 	
<p>Age of fluid since the initial charge. When was the last time the machine(s) and sump were cleaned out?</p> <ul style="list-style-type: none"> ❑ Over time, increases in contaminants like metal fines, dirt, cleaners, tramp oils, bacterial decomposition, etc. increase potential for skin irritation. ❑ Check with MRF supplier concerning when DCR (drain, clean, recharge) is recommended. ❑ Are MRF fluid system clean outs routinely scheduled? 	
<p>Have any recent changes occurred with the fluid, or the fluid system?</p> <ul style="list-style-type: none"> ❑ Changes in fluid concentration, adding too much additive, mixing fluids during MRF change, cleaning the system, filtration changes, water changes, and change in tool/process are examples of changes which may increase the potential for skin irritation. 	
<p>Have there been any MRF formulation changes?</p> <ul style="list-style-type: none"> ❑ It is good product stewardship to communicate changes to customers. Rarely do these changes increase irritation potential. ❑ Employees should know how to obtain MSDSs for the chemicals with which they work. 	

Consideration	Findings and Comments
Engineering and Environmental Parameters	
<ul style="list-style-type: none"> ❑ System designs, which consider mist generation, engineering controls for mist collection, and an adequately designed and maintained general dilution ventilation system, are important factors to consider in the MRF environment. ❑ Increased mist/splash increases contact and irritation potential. 	
<p>Are workers in direct skin contact with the MRF at any time?</p> <ul style="list-style-type: none"> ❑ What is the expected frequency and duration of worker contact with MRF? 	

Consideration	Findings and Comments
<p>Engineering and Environmental Parameters</p> <ul style="list-style-type: none"> ❑ Many workers come into occasional contact with MRFs. Good skin washing practices and skin care regimen are critical. ❑ MRFs are not designed for repeated contact with unprotected skin. ❑ Wearing contaminated clothing increases the potential for skin irritation. 	
<p>Degrees of machine enclosure, e.g. splash guards vs. complete enclosure</p> <ul style="list-style-type: none"> ❑ Splash guards help prevent direct contact with the fluid – are they present? Removed for maintenance/repair? 	
<p>Do drain lines from LEV equipment or HVAC units run back to the sump?</p> <ul style="list-style-type: none"> ❑ Do not add back collected MRF to the system sump. Adding back collected MRF increases microbiological contamination in the sump. 	
<p>Describe automation for parts handling and tool changes.</p> <ul style="list-style-type: none"> ❑ The greater the automation, the less the worker needs to handle the parts, which can reduce the potential exposure to contaminants. ❑ High levels of automation and frequent tool changes can place maintenance personnel in contact with fluid and fluid residues. 	
<p>If the process is enclosed, does mist come out of the door when opened?</p> <ul style="list-style-type: none"> ❑ The enclosure needs to be closed long enough for mist generation to stop and the mist generated to be captured and removed. 	
<p>Describe other industrial processes present in the area.</p> <ul style="list-style-type: none"> ❑ Review near-by industrial processes for possible routes of contamination of the MRF ❑ Other processes, such as adjacent parts washers, can contribute to skin irritation potential. ❑ If contamination or carry-over is suspected, check that product MSDS to determine if the product is irritating or even caustic to the skin. 	
<p>Is the fluid used to move chips?</p> <ul style="list-style-type: none"> ❑ If so, the very small particles (fines, chips, swarf) that are entrained in the fluid can injure the skin by causing small scratches. 	

Consideration	Findings and Comments
Engineering and Environmental Parameters	
<p>Housekeeping: are chips, swarf, or MRF present on floors, tables, etc?</p> <ul style="list-style-type: none"> ❑ When mist is not effectively collected, it can settle onto adjacent surfaces (desks, chairs, and workbenches. This layer can contain other contaminants entrained in the fluid as well, making the residue potentially irritating when there is direct skin contact. ❑ A dirty workplace can be an indication of poor housekeeping. Handling chips without proper protective equipment causes cuts that lead to irritation. 	
<p>Is make-up air provided?</p> <ul style="list-style-type: none"> ❑ Exhaust ventilation systems (whether they are local or dilution) require replacement of exhausted air to ensure they operate properly. Be sure that replacement (or make-up) air, whether through open doors, windows, wall louvers, or replacement air system, is available and operating properly. 	
<p>Is local exhaust ventilation provided for the machines?</p> <ul style="list-style-type: none"> ❑ Local exhaust ventilation (LEV) is more effective than dilutional ventilation in reducing skin irritation. 	

Consideration	Findings and Comments
Personal Protective Equipment (PPE) and Skin Care	
<ul style="list-style-type: none"> ❑ A combination of PPE and skin care regimen can work in conjunction with engineering controls to prevent the occurrence of potential skin irritation when working with MRFs. ❑ Skin cleaning, moisturizing, and protecting should be addressed in an integrated way. 	
<p>Are the workers routinely in direct skin contact with the MRF?</p> <ul style="list-style-type: none"> ❑ Avoid direct contact with MRFs as much as possible. ❑ Can the process be changed to avoid direct contact? ❑ Does the worker contact spilled MRF residues? If so, PPE must be worn. ❑ PPE needs to be appropriately selected. 	

Consideration	Findings and Comments
Personal Protective Equipment (PPE) and Skin Care	
<p>Do the machine operators use PPE? What types? Are they being used properly?</p> <ul style="list-style-type: none"> ❑ Areas, especially hands/arms, should be protected, if possible, with appropriate gloves suitable to the process. ❑ Impermeable aprons reduce the probability of irritation if the front of the body becomes wet during the machining process. 	
<p>Are skin cleansing, moisturizing, protection addressed?</p> <ul style="list-style-type: none"> ❑ An integrated system to protect the skin is strongly recommended – especially in the cold weather seasons. Consult a dermatologist or occupational physician if necessary. 	
<p>Are hand washing sinks with hot & cold water accessible to the work area?</p> <ul style="list-style-type: none"> ❑ Wash hands several times throughout the day with very warm water, especially before/after eating, using the restroom, and before leaving the workplace for the day. ❑ Dry hands thoroughly after cleansing. 	
<p>What types of hand washing soaps are used in the facility?</p> <ul style="list-style-type: none"> ❑ Cleansers should not be too abrasive. Use cleansers strong enough to clean the hands and be able to be used repeatedly throughout the day without damaging the skin. ❑ Do NOT use solvents or other materials not designed to be skin cleaners – they dry out and damage the skin. ❑ Use moisturizers for mild dryness or chapping. Do not use moisturizers if the skin is visibly inflamed as contact dermatitis may worsen. 	
<p>Do workers have skin moisturizers available to use?</p> <ul style="list-style-type: none"> ❑ Moisturizing creams should be applied to clean dry skin. ❑ Moisturizing prevents excessive skin drying. The natural oils keep the skin healthy and help avoid chapping where the skin begins to breakdown and skin problems can begin. 	
<p>Do the employees use barrier creams? What type? Are the creams used correctly?</p> <ul style="list-style-type: none"> ❑ Barrier creams act as a preventive measure against irritants. They should be selected on the basis of the chemicals with which the worker comes into contact – different creams for different applications. ❑ Use only on healthy skin – not on already irritated skin. Never use a barrier cream over a rash. ❑ Although barrier creams and moisturizing creams protect the skin, they must be viewed as 	

Consideration	Findings and Comments
Personal Protective Equipment (PPE) and Skin Care	
<p>supplements only. They do not replace good personal hygiene or the use of chemical protective gloves where appropriate.</p>	
<p>Are shop towels used to clean arms and hand?</p> <ul style="list-style-type: none"> ❑ Shop towels contain residues like small metal fines and solvents. Do NOT use shop towels for drying hands after washing. 	
<p>Do affected employees wear the same clothing on successive days?</p> <ul style="list-style-type: none"> ❑ MRFs and other contaminants dry into the uniforms/clothing, build up, and are released when wetted again. ❑ Avoid laundering uniforms at home. ❑ Wear clean clothing each day. 	
<p>Is compressed air used to clean hands, arms, or clothing?</p> <ul style="list-style-type: none"> ❑ The use of compressed air on skin is very dangerous, and can cause severe, dermatological damage, including driving contaminants into the skin. 	
<p>Are break areas provided outside the machining environment?</p> <ul style="list-style-type: none"> ❑ Consume food and beverages away from the machining area. ❑ Chairs and tables in the machining environment can become a collecting area for dried mist. 	

Consideration	Findings and Comments
Additional Things to Consider	
<ul style="list-style-type: none"> ❑ Use an integrated approach when evaluating the facility for skin irritation potential factors. Often it is a combination of factors, rather than one single factor, that raises this potential. 	
<p>Are other chemicals used on the part? (rust preventives, parts cleaners, degreasers, various oils, dyes, sprays, etc.)</p> <ul style="list-style-type: none"> ❑ How does the use of the other chemicals impact workers? 	
<p>Are there any other chemicals that can get into the MRF system? (e.g., wash tanks, floor cleaners, heat treatment, leaking equipment)</p>	

Consideration	Findings and Comments
<p>Additional Things to Consider</p> <ul style="list-style-type: none"> <input type="checkbox"/> Process chemical carry-over from alkaline parts washers or floor cleaners can increase alkalinity and increase potential for dermatitis. <input type="checkbox"/> Review shop layout. If a parts washer precedes a machining station in which workers have developed dermatitis, check concentrations of cleaner and MRF to be sure contamination has not occurred. <input type="checkbox"/> Review shop maintenance practices. Make sure that spent floor cleaner is not squeegeed into MRF sumps. 	
<p>Do workers use any solvents or cleaners in their jobs? (e.g., machine cleaners, etc.)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Cleaners – are usually alkaline and skin/eye contact can cause severe irritation or even chemical burns. <input type="checkbox"/> Solvents – contact dries out the skin; some can be absorbed through the skin. <input type="checkbox"/> Soaps/detergents - contact acts to dry out the skin. After washing, moisturizing creams should be applied to prevent dryness. 	
<p>What organization/who is responsible for fluid and sump maintenance?</p> <ul style="list-style-type: none"> <input type="checkbox"/> Contract service. <input type="checkbox"/> In house department. <input type="checkbox"/> Other. 	
<p>Who is the site occupational safety and health resource? Phone number?</p> <ul style="list-style-type: none"> <input type="checkbox"/> On site (daily or part of the time). <input type="checkbox"/> Off site. 	
<p>Has any air monitoring been performed? What methodology was employed? What are the reported results of the air monitoring?</p> <ul style="list-style-type: none"> <input type="checkbox"/> Excessive mist or other chemical contaminants identified? <input type="checkbox"/> Type of sample – area or personal. <input type="checkbox"/> Method – obtaining sample and analyzing sample – so the samples can be interpreted and compared. 	
<p>What is your opinion of the general housekeeping in the work area?</p> <ul style="list-style-type: none"> <input type="checkbox"/> Same for all shifts? <input type="checkbox"/> Spills cleaned promptly? <input type="checkbox"/> Does the maintenance department clean up after repair/maintenance. 	

Consideration	Findings and Comments
Employee Feedback	
<p>-</p> <ul style="list-style-type: none"> <input type="checkbox"/> Number of employees? <input type="checkbox"/> Which Departments and specific job titles? <input type="checkbox"/> Which shift and shift length? <input type="checkbox"/> Weather conditions outside? <input type="checkbox"/> Working in normal operation conditions? <input type="checkbox"/> Does worker have a second job or hobby that may have an effect on this condition? 	
<p>What are the specific employee health complaints?</p> <ul style="list-style-type: none"> <input type="checkbox"/> What are the symptoms -- rash, pain, skin cracking, itching? <input type="checkbox"/> New or has it happened before? <input type="checkbox"/> Are there other health complaints? 	
<p>Physical description of the skin irritation</p> <ul style="list-style-type: none"> <input type="checkbox"/> What signs and symptoms are present? 	
<p>What parts of the body are affected?</p> <ul style="list-style-type: none"> <input type="checkbox"/> Hands and/or arms. <input type="checkbox"/> Other body parts like thighs. 	
<p>Have the affected workers seen a nurse or doctor in relation to their condition?</p> <ul style="list-style-type: none"> <input type="checkbox"/> Yes. <input type="checkbox"/> No. <input type="checkbox"/> How soon after problem developed? 	
<p>Has the skin condition been diagnosed by a physician?</p> <ul style="list-style-type: none"> <input type="checkbox"/> Was the condition determined to be work-related? <input type="checkbox"/> What was the diagnosis? <input type="checkbox"/> Was prescription medication or other medical therapy prescribed? 	
<p>Are the cases of skin irritation classified as OSHA Recordable?</p> <ul style="list-style-type: none"> <input type="checkbox"/> Yes. <input type="checkbox"/> No. <input type="checkbox"/> Describe treatment. 	
<p>Do any specific work tasks seem to be related to the exposure or the condition?</p> <ul style="list-style-type: none"> <input type="checkbox"/> Tasks where hands have direct contact with MRF. <input type="checkbox"/> Tasks where hands have direct contact with other chemicals. 	
<p>Have non-occupational exposures been considered?</p> <ul style="list-style-type: none"> <input type="checkbox"/> Some workers may have jobs and/or hobbies in which there can be exposure to chemicals or other substances that can cause/contribute to 	

Consideration	Findings and Comments
Employee Feedback	
potential skin irritation. Gardening, mechanical work, home/furniture repair, etc.	
Do the affected workers report improvement in symptoms when away from work for several days? <ul style="list-style-type: none"> <input type="checkbox"/> Yes. If so, what type of improvement? <input type="checkbox"/> No. 	

Other Observations and Comments:

DISCLAIMER

ILMA, through creating and making available this Dermal Assessment Guide (DAG), is not undertaking to meet the duties of the manufacturers, suppliers, distributors or end-users of metalworking and metal removal fluids to warn and properly train their employees (or any other persons) concerning their obligations under any laws or regulations, as well as health and safety risk precautions.

Information concerning safety and health risks and proper precautions with respect to particular materials and conditions should be obtained from the manufacturer or supplier of the material, or the applicable material safety data sheet.

The DAG may be used by anyone desiring to do so. ILMA has made every effort to assure the accuracy and reliability of the information it contains. HOWEVER, ILMA MAKES NO REPRESENTATION, WARRANTY OR GUARANTY IN CONNECTION WITH THE DAG AND HEREBY EXPRESSLY DISCLAIMS ANY LIABILITY OR RESPONSIBILITY FOR LOSS OR DAMAGE OF WHATEVER NATURE RESULTING FROM ITS USE, OR FOR THE VIOLATION OF ANY LAW OR REGULATION WITH WHICH THE DAG MAY CONFLICT.