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Dr. Richard Niemeier
Director
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NIOSH
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Dear Dr. Niemeier:

Thank you for the opportunity to respond to your May 16 Federal Register Notice (FR Vol. 55, No. 97, p.20637) requesting comments and secondary data relevant to occupational exposure to cutting fluids. Your extension of the deadline from June 18 to August 20 was most helpful and greatly appreciated. I believe you will also find it beneficial to your investigation.

By way of introduction, Master Chemical is a Perrysburg, Ohio, manufacturer of metalworking fluids and related equipment for the metalworking industry worldwide. We market a complete range of products including water miscible cutting and grinding fluids, specialty cutting oils, washing compounds, rust preventatives, EDM oils, stamping and drawing compounds and tapping fluids. Our related hardware includes recycling systems, filters and other fluid handling equipment. Master Chemical has been a leader in our industry for nearly 40 years, pioneering water miscible cutting and grinding fluids, introducing fluid recycling and originating the coolant management concept.

Enclosed for your review is a limited selection from the available literature that provides an overview of metalworking fluids issues. We believe the information presented here thoroughly answers each of the questions presented in your Federal Register notice. However, in the following pages, Master Chemical has also attempted to briefly address each of your questions individually. Keeping in mind that there are a considerable number of interacting variables that impact on metalworking fluids and the metalworking environment, the following remarks are generalizations based on our 40 years of experience in the industry.

1. Basis for the selection and use of a specific cutting fluid formulation for a specific type of metalworking.

Items taken into consideration when recommending a fluid include:

- type of metal being machined
- type, age and condition of the machine tool
- type of operation
- operator acceptance
- knowledge and experience of the fluid manufacturer
- knowledge and experience of the customer
- customer specifications/preferences
- amount and type of contamination entering the system
- specific chemical restrictions, as in the case of nuclear applications
- downstream operations (plating, painting, welding, washing, etc.)
- waste treatment parameters
- availability and use of recycling equipment

2. Average length of use of different cutting fluids.

Fluid life may range from as short as a few seconds to as long as several years. In some forming (stamping, drawing) operations as well as certain chip making (milling, drilling) operations, the fluid may be applied via misting or rolling techniques. In such instances, the fluid is intended for a one time, single application. It is not recirculated through the machine tool for reuse, but is carried off on the part. At the other extreme, companies that practice good coolant management techniques (as described in many of the enclosed articles and papers, particularly enclosures 4, 5, 24, 25, and 26) have achieved fluid lives of several years.

3. Types and concentrations of additives such as wetting agents and surfactants, anti-foaming agents, water softeners, extreme pressure additives, corrosion inhibitors, dyes, buffer components, emulsifiers, coupling agents, anti-weld and anti-rust agents, and bactericides in new and used cutting fluids.

Typical materials used in metalworking fluid formulations include the following:

Typical Ingredient	Percent Range
- mineral, vegetable, and animal oils (The mineral oils are limited to severely solvent refined and/or severely hydro-treated petroleum distillates, including heavy and light paraffinic and naphthenic fractions)	0-100
- chlorine and sulfur derivatives of mineral, vegetable and animal oils	0-100

Typical Ingredient	Percent Range
- ethylene oxide and propylene oxide derivatives of alcohols, fats and esters	0-100
- amines and amides	0-25
- caustic soda/potash	0-25
- carboxylic acids	0-25
- benzoates	0-25
- sulfonates	0-25
- borates	0-25
- silicates	0-25
- silicones	0-0.5
- glycols	0-100
- biocides	0-2
- fragrance compounds	0-0.5
- dyes	0-0.5
- anti-foams	0-0.5
- water	0-90

4. Methods for the evaluation of the quality of used cutting fluids and basis for disposal or reuse.

   The methods used depend upon the abilities and needs of the customer. In general, tests such as those noted in enclosure 1, "Laboratory Procedures for Tech Service Samples" would be routinely conducted. More sophisticated instrumentation and analytical techniques may be employed on an as needed basis.

5. Methods and testing intervals to evaluate cutting fluid pH, effective additive concentrations, and contaminant levels.

   Methods would be as those noted in our answer to question #4. Intervals again depend upon the abilities and needs of the customer. For those customers with the in-house capability, fluids might be checked on site every shift. For others, it may be via submission of samples once a week, once a month, etc., to the fluid manufacturer for evaluation.

6. A description of the types of contamination that can be found in cutting fluids (e.g., machine oil, metal, nitrosamines, polycyclic aromatic hydrocarbons, food, human waste).

Common contaminants of cutting fluids include the following:

- tramp oil
  - hydraulic oils
  - lubricating oils
  - way oils
  - cutting oils

- metals
  - chips and fines
  - dissolved metals

- mineral buildup from water

- coatings on parts
  - paints
  - oils
  - greases
  - rust preventatives
  - mold release agents

- microorganisms
  - other workplace chemicals
  - solvents and other degreasers
  - floor cleaning compounds
  - spill cleanup materials
  - machine cleaning compounds
  - parts washing compounds
  - other cutting fluids
  - acid bath chemicals

- grinding wheel swarf

- abrasives and abrasive bonding agents

- general "garbage"
  - discarded food and packages
  - tobacco products (cigarettes, cigars, chewing tobacco, etc.)
  - parts packing materials (paper, cardboard, wood, plastic, etc.)
  - shop rags, paper towels
  - human saliva, urine, and feces are not common contaminants, but do occur occasionally

Nitrosamines would not appear to present a significant problem since the elimination of nitrite from most fluid formulations in the early 1980s. PNAs also would not seem to be a significant concern as the oils in use today in cutting fluids are severely hydrotreated and/or severely solvent refined to remove those PNAs suspected of being potential chronic hazards.

7. A description of methods for refining or processing used cutting fluids and safety checks (e.g., quality assurance, toxicity testing) for re-refined fluids.

   Master Chemical does not refine or process used cutting fluids nor do we use such fluids in our formulations. Therefore, we have no direct knowledge of the methods used.

8. Health effects (e.g., skin irritation, inflammation, infections, respiratory symptoms, or disease, systemic affects) related to occupational exposure to cutting fluids, additives or contaminants.

   Most health complaints received involve skin irritation. The majority of such complaints are usually attributable to poor personal hygiene, fluid contamination, or outside influences (other workplace chemicals such as solvents or off-the-job activities such as gardening, painting, mechanical work, etc.) Our products are evaluated by an independent toxicological laboratory prior to marketing to assure that they are not primary skin irritants or sensitizers. Additional studies for systemic toxicity and irritation potential are also conducted on each product. (See enclosure 3 (green booklet) for the protocols used.)

9. Measured airborne concentrations of cutting fluids and additives in the workplace.

   Master Chemical has no situations in-plant requiring air monitoring and has no direct knowledge from customer facilities. Occasional feedback from customers has indicated that TLVs/PELs are not exceeded.

10. Personal protective equipment, engineering controls and work practices that have been used to limit worker exposure to cutting fluids, additives and contaminants.

    Personal protective equipment used by machine tool operators will depend upon the fluid in use and prevailing conditions in the specific application and the workplace in general. Such equipment may include barrier creams; various types of rubber and cloth gloves, sleeves and aprons; safety glasses, goggles and face shields; dust masks and respirators.

Engineering controls include machine tool designs which minimize operator contact with fluids, proper fluid application, use of shielding techniques and good ventilation (exhaust fans, mist collectors, etc.)

Good work practices are included in the concept of coolant management. As mentioned above, several of the enclosed papers discuss this concept in detail. Education of the employer and operator with regard to coolant management and thus proper use of cutting fluids is key to instilling good work practices. Master Chemical has provided such education to the metalworking industry for nearly 40 years. Currently, we conduct several seminars each month bringing operators and their management into our facilities for instruction. Additionally, our field personnel are equipped to provide in-plant seminars and training at all customer locations on an ongoing basis.

Dr. Neimeier, I trust you will find these comments and enclosed materials helpful. Should you have any questions or care to discuss this material in further detail, please contact me at your earliest convenience.

Sincerely,

Michael J. Gehring
Manager-Health, Safety
and Environmental Affairs

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enclosures

Enclosures

1. Laboratory Procedures for Tech Service Samples
2. General Acceptable Water Soluble Coolant Quality Limits
3. Toxicity Reports for TRIM® 50/50 Water Miscible Chemical Cutting and Grinding Fluid Concentrate and Working Solution
4. Coolant Management Packet
5. Controlling and Improving the Manufacturing Process, Presentation at the 1990 Pacific Conference on Manufacturing, December 17-21, 1990 in Australia
6. Dermatitis in the Metalworking Industry, ASLE Publication
7. Does Your Fluid Cause Skin Problems? Or is it Your Shop's Hand Cleanser?, Oil Daily, May 2, 1989
8. Cutting Oils, Emulsions and Drawing Compounds, National Safety Council Data Sheet I-719-86
9. Patch Testing of Coolant Fractions, September, 1975, Journal of Occupational Medicine
10. Cutting Fluids: Their Use and Effect on the Skin, Occupational Medicine: State of the Art Reviews, Vol 1 No. 2, April-June, 1986
11. Bacteria and Soluble Oil Dermatitis, Contact Dermatitis, 1980
12. Do Metalworking Fluid Microbs Cause Infectious Disease?, The Lubricator, November, 1979
13. Types of Coolants and Their Properties
14. The Effective Utilization of Cutting Fluids to Improve Metal Removal Rates, American Society of Tool and Manufacturing Engineers, 1962
15. Machining Cast Iron, American Machinist, February, 1981
16. How Coolant Affects Drill Wear, American Machinist, February 1971
17. Lubrication or Cooling? Which is More Important in a Grinding Fluid?, Grinding and Finishing, May, 1986

18. Synthetic Coolants: No Panacea, Manufacturing Engineering, October 1983

19 Rules of Thumb for Grinding Wheel Selection

20. An Engineer's Guide to Deep Hole Drilling Cutting Fluids, Cutting Tool Engineering, November-December, 1980

21. The Application of High Speed, Disc Bowl Centrifuges to Water Miscible Cutting and Grinding Fluids, Master Chemical Corporation Technical Paper

22. Considerations in The Selection of Coolants Used in Flexible Machining Centers, SME Technical Paper, 1986

23. Water is Water...Or is It?, Modern Machine Shop

24. Care and Control of Coolant Sumps, Plant Engineering, January 8, 1981

25. The Payoff in Coolant Recycling, American Machinist, July, 1983

26. Coolant Management: Rx for Ending Coolant "Headaches", Carbide and Tool Journal, March-April, 1985

27. Cost and Cutting Fluids, Material Removal Technical Division Newsletter, December, 1965.

28. Exotics and Chlorinated Fluids Do Mix, Modern Machine Shop

29. Microbial Causes of Cutting Fluid Degradation, SME Technical Paper, 1974

30. Filtration of Coolants Pays Dividends, SME Technical Paper, 1970

31. Cutting Fluid Maintenance, SME Technical Paper, 1971

32. Cutting Fluid Selection and Maintenance Factors Which Determine Product Longevity, SME Technical Paper, 1974

33. Cost Savings Through Cutting Fluid Selection, SME Technical Paper, 1969

34. Setting Machine Feeds and Speeds, Optimization and Machining Economics, SME Technical Paper, 1962

35. 10,000 Holes Per Tap, Modern Machine Shop

36. Antimicrobial Agents for Water-Based Metalworking Fluids, Journal of Occupational Medicine, April 1981