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An American National Standard

Standard Terminology for Metalworking Fluids and Operations[1]

This standard is issued under the fixed designation E2523; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This terminology standard provides a compilation of ASTM and non-ASTM consensus definitions of terms used in the metalworking industry.

1.2 This terminology standard does not purport to be an exhaustive lexicon. Rather, it defines terms relevant to metalworking fluid management and metalworking fluid health and safety.

1.3 This terminology standard defines primary metalworking operations, fluid types, and other terms germane to the practice of metalworking fluid management.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1356 Terminology Relating to Sampling and Analysis of Atmospheres

D2881 Classification for Metalworking Fluids and Related Materials

D6161 Terminology Used for Microfiltration, Ultrafiltration, Nanofiltration and Reverse Osmosis Membrane Processes

D7049 Test Method for Metalworking Fluid Aerosol in Workplace Atmospheres

E1302 Guide for Acute Animal Toxicity Testing of Water-Miscible Metalworking Fluids

E1497 Practice for Selection and Safe Use of Water-Miscible and Straight Oil Metal Removal Fluids

E1687 Test Method for Determining Carcinogenic Potential of Virgin Base Oils in Metalworking Fluids

E1972 Practice for Minimizing Effects of Aerosols in the Wet Metal Removal Environment (Withdrawn 2017)[3]

E2144 Practice for Personal Sampling and Analysis of Endotoxin in Metalworking Fluid Aerosols in Workplace Atmospheres

E2148 Guide for Using Documents Related to Metalworking or Metal Removal Fluid Health and Safety

E2169 Practice for Selecting Antimicrobial Pesticides for Use in Water-Miscible Metalworking Fluids

E2275 Practice for Evaluating Water-Miscible Metalworking Fluid Bioresistance and Antimicrobial Pesticide Performance

E2563 Practice for Enumeration of Non-Tuberculosis *Mycobacteria* in Aqueous Metalworking Fluids by Plate Count Method

E2564 Practice for Enumeration of *Mycobacteria* in Metalworking Fluids by Direct Microscopic Counting (DMC) Method

E2657 Practice for Determination of Endotoxin Concentrations in Water-Miscible Metalworking Fluids

E2693 Practice for Prevention of Dermatitis in the Wet Metal Removal Fluid Environment

E2694 Test Method for Measurement of Adenosine Triphosphate in Water-Miscible Metalworking Fluids

2.2 *Government Standards:*[4]

29 CFR 1910.1200 Occupational Safety and Health Standards, Hazard Communication

40 CFR 156 Labeling Requirements for Pesticides and Devices

3. Significance and Use

3.1 Personnel from a wide range of disciplines contribute to metalworking fluid management and plant environment health

[1] This terminology is under the jurisdiction of ASTM Committee E34 on Occupational Health and Safety and is the direct responsibility of Subcommittee E34.50 on Health and Safety Standards for Metal Working Fluids.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, http://www.access.gpo.gov.

and safety management. Consequently, terms familiar to some stakeholders will be unfamiliar to others.

3.2 This terminology standard provides, in a single document, a compilation of definitions used by personnel involved with both metalworking environment health and safety and fluid management.

3.3 Use of terms as defined in this terminology standard will enable all stakeholders to use metalworking industry terms in the appropriate context, thereby improving interdisciplinary communications.

4. Terminology

acid-fast bacteria, *n*—a distinctive staining property of *Mycobacteria* due to their lipid-rich cell walls.

DISCUSSION—Once stained, mycobacterium resist decolorization when exposed to acidified organic solvents and are, therefore, informally designated acid-fast. **E2564**

active ingredient (a.i.), *n*—the chemical or components of an antimicrobial pesticide that provides its antimicrobial performance. **E2169, E2275**

acute dermal toxicity, *n*—health hazards likely to arise from short-term exposure to a substance via the skin or mucosa. **E1302**

DISCUSSION—Results of acute dermal toxicity testing may provide initial information on the dermal absorption and the mode of toxic action of a substance. Moreover, some measure of irritation caused by the fluid may be obtained by observing local tissue damage at the site of application. Endpoint: mortality.

acute inhalation toxicity, *n*—the potential of a fluid, vapor, or gas to cause death and other adverse health effects when inhaled for a specified time period. **E1302**

DISCUSSION—The endpoint may be mortality or other specific health effect designated in the test protocol.

acute oral toxicity, *n*—health hazards likely to arise from short-term exposure to a substance via the oral route (ingestion). **E1302**

DISCUSSION—Results of acute oral toxicity tests are used to develop warning statements on labels as may be required by OSHA Hazard Communication Standard 29 CFR 1910.1200 or Federal Hazardous Substances Act. These are also used to establish a dosage regimen for subchronic and other testing. Endpoint: mortality.

adenosine monophosphate (AMP), *n*—the molecule formed by the removal of two molecules of phosphate (one pyrophosphate molecule) from ATP. **E2694**

adenosine triphosphate (ATP), *n*—a molecule comprised of a purine and three phosphate groups that serves as the primary energy transport molecule in all biological cells. **E2694**

aerosol, *n*—a dispersion of solid or liquid particles in a gaseous medium. **D1356**

antimicrobial pesticide, *n*—chemical additive registered under 40 CFR 156, for use to inhibit growth, proliferation, or both of microorganisms. **E2169, E2275**

DISCUSSION—Antimicrobial pesticides are registered for one or more end-use applications, or sites, for use within an approved dose range.

aseptic, *adj*—sterile, free from viable microbial contamination. **E2694**

as supplied (a.s.), *adj*—antimicrobial pesticide finished product including the active ingredients, solvent, and any additional inactive ingredients. **E2275**

background RLU, *n*—the quantity of relative light units resulting from running the Method without incorporation of the sample. **E2694**

bactericide, *n*—an antimicrobial pesticide specifically or primarily effective against bacteria. **E2169**

bioburden, *n*—the level of microbial contamination (biomass) in a system. **E2169**

DISCUSSION—Typically, bioburden is defined in terms of either biomass or numbers of cells per unit volume or mass or surface area material tested (g biomass/mL; g biomass/g sample; cells/mL sample; colony forming units (CFU)/mL sample and so forth).

biocide, *n*—any chemical intended for use to kill organisms. **E2169, E2275**

DISCUSSION—Biocide is a term usually used synonymously with the preferred *antimicrobial pesticide* or *microbicide*.

biodeterioration, *n*—the loss of commercial value, performance characteristics, or both of a product (metalworking fluid) or material (coolant system or finished parts) through biological processes. **E2169**

biofilm, *n*—a film or layer composed of microorganisms, biopolymers, water, entrained organic and inorganic debris that forms as a result of microbial growth, proliferation, and excretion of polymeric substances at phase interfaces (liquid-liquid, liquid-solid, liquid-gas, and so forth). (synonym: *skinnogen layer*). **E2169**

bioluminescence, *n*—the production and emission of light by a living organism as the result of a chemical reaction during which chemical energy is converted to light energy. **E2694**

biomass, *n*—any matter which is or was a living organism or excreted from a microorganism **D6161**

bioresistant, *adj*—ability to withstand biological attack. **E2169, E2275**

DISCUSSION—Bioresistant, or recalcitrant, chemicals are not readily metabolized by microorganisms.

biostatic, *adj*—able to prevent existing microbial contaminants from growing or proliferating, but unable to kill them. **E2169, E2275**

DISCUSSION—Biostatic additives may be registered antimicrobial pesticides or unregistered chemicals with other performance properties. The difference between biocidal and biostatic performance may be attributed to dose, chemistry, or both.

boring, *v*—enlarging a hole that already has been drilled.

DISCUSSION—Generally, boring is an operation of truing the previously drilled hole with a single-point, lathe-type tool. Boring is essentially internal turning.

breathing zone, *n*—that location in the atmosphere at which persons breathe. **D1356**

DISCUSSION—The worker's breathing zone consists of a hemisphere 300-mm radius in front of the face and measured from a line bisecting the ears. D7049

broaching, *v*—an operation in which a cutter progressively enlarges a slot or hole, or shapes a workpiece exterior.

DISCUSSION—Low teeth start the cut, intermediate teeth remove the majority of the material, and high teeth finish the task. Broaching can be a one-step operation, as opposed to milling and slotting, which require repeated passes. Typically, however, broaching also involves multiple passes.

bubbler, *n*—a sampling device consisting of a gas dispenser immersed in an absorbing liquid. D1356

coining, *v*—a closed-die squeezing operation in which all surfaces of the work are restrained (coined).

DISCUSSION—Coining often imparts a pattern or shape onto the workpiece. Coining also refers to a press-brake bending operation in which the punch bottoms against the workpiece and the die. It also refers to a process similar to bottoming although greater force is applied. Coining alters the radius, and bottoming sets the bend open but does not affect shape.

collector, *n*—a device for removing and retaining contaminants from air or other gases. D1356

contaminant, *n*—substances contained in in-use metalworking fluids that are not part of the received fluid, such as abrasive particles, tramp oils, cleaners, dirt, metal fines and shavings, dissolved metal and hard water salts, bacteria, fungi and microbiological decay products, and waste. E1497

contamination control, *n*—maintenance of bioburden at an operationally defined level, at or below which the bioburden does not affect the fluid or system adversely. E2169

control, *v*—to prevent, eliminate, or reduce hazards related to the use of metalworking fluids in metalworking processes and to provide appropriate supplemental, or interim protection, or both, as necessary, to employees. E1497

control standard endotoxin (CSE), *n*—a purified preparation of endotoxin based on the USP Reference Standard Endotoxin (RSE); used in laboratories to prepare standard solutions. E2657

coolant, *n*—any liquid used for the purpose of facilitating heat removal from metal removal, forming, or both types of metalworking operations.

DISCUSSION—Coolants are typically classified by the general chemical composition as emulsifiable oils, semi-synthetic oils, straight oils, or synthetic fluid (Classification D2881). See definitions 4.32, 4.72, 4.77 and 4.78, respectively. Coolants are used primarily to cool and lubricate.

culturable, *adj*—microorganisms that proliferate as indicated by the formation of colonies on solid growth media or the development of turbidity in liquid growth media under specific growth conditions. E2694

demand, *n*—the sum of all factors that contribute to decreasing the effective concentration of antimicrobial pesticide. E2169

DISCUSSION—Processes contributing to demand include, but are not limited to, reactions with microbes, reactions with other chemicals in the fluid, adsorption onto surfaces, absorption into materials, and temperature.

dermatitis, *n*—an inflammatory response of the skin. E1497

DISCUSSION—Dermatitis can result from a wide variety of sources and processes. The most common origins are irritants or allergic responses to a chemical or physical agent. Signs and symptoms that typify the initial onset of dermatitis include: erythema (redness); edema (swelling); pruritis (itching); and vesiculation (pimple-like eruptions). In more severe cases, fissures (deep cracks) and ulcers (open sores) may develop. The condition is usually reversible when exposure to the causative agent ceases. More severe cases may require more time and some medical attention. Some individuals may be at higher risk.

dilution ventilation, *n*—referring to the supply and exhaust of air with respect to an area, room, or building, the dilution of contaminated air with uncontaminated air for the purpose of controlling potential health hazards, fire and explosion conditions, odors, and nuisance-type contaminants, from Industrial Ventilation: A Manual of Recommended Practice. E2693

dose, *n*—concentration of antimicrobial pesticide added to treated solution. E2169, E2275

DISCUSSION—Dose is generally expressed as either ppm active ingredient (a.i.) or ppm as supplied (a.s.).

drawing, *v*—process by which a metal blank is forced to flow through a die cavity without any constraint other than against buckling.

DISCUSSION—Internal resistance flow of the metal towards the punch and dies sets up compressive stresses which, combined with tensile stresses created by the motion of the punch, produce two-dimensional shear.

drilling, *v*—operation in which a rotating tool is used to create a round hole in a workpiece.

DISCUSSION—Drilling is normally the first step in machining operations such as boring, reaming, tapping, counterboring, countersinking, and spotfacing.

emergency, *n*—any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that results in an uncontrolled release of a significant amount of metalworking fluid. E1497

employee exposure, *n*—the exposure to metalworking fluids and contaminants which would occur without corrections for protection by any respirator or other personal protective equipment that is in use.

emulsifiable oil (frequently referred to as "soluble oil"), *n*—a metalworking fluid that generally contains >30 % oil before dilution with water. D2881

DISCUSSION—Emulsifiable oils contain emulsifiers and other functional additives and generally create macro-emulsions (average size >1.0 μm) when diluted with water.

DISCUSSION—Emulsifiable oils are blended with water in their end use.

emulsifier, *n*—a surface-active agent, or surfactant, that is at least partially soluble in both liquids (phases) of an emulsion, and thus stabilizes one in the other. D2881

emulsion, *n*—a relatively stable mixture of two immiscible liquids, one of which is held in suspension in the other by small amounts of emulsifiers. D2881