

CIMCOOL[®]

Technical Report

Milacron Marketing Co. | Consumable Products Division | Cincinnati, Ohio 45209

Water-based Metalworking Fluids & Volatile Organic Compounds (VOC)

The Clean Air Act

Our current national air pollution control program is based on the 1970 version of The Clean Air Act law that was passed in 1963. The main purpose of the act is to protect and enhance the quality of the Nation's air resources, promoting public health and welfare. The most far-reaching revisions of the 1970 law occurred with the 1990 Clean Air Act Amendments, which are often referred to as the 1990 Clean Air Act. These revisions increased efforts to reduce emissions of volatile organic compounds (VOC) and hazardous air pollutants (HAP'S). Facilities releasing materials into the air must have emission permits, following the regulations and standards of their local, state and federal agencies.

Why worry about VOC's?

Volatile organic compounds (VOC's) are smog-forming chemicals found in many products, from paints, chlorinated solvents, hair spray, charcoal starter fluid, plastic popcorn packaging to metalworking fluids.

Definition of Volatile Organic Content in Metalworking Fluids:

The United States Environmental Protection Agency (EPA) applies Reference Method 24 for determining the VOC of water based metalworking fluid. In EPA Method 24 the percentage weight of volatile ingredients is determined by following ASTM D2369 the Standard Test Method for Volatile Content of Coatings. VOC is defined in Method 24 as the weight percent of the fluid that evaporates at 110°C after 1 hour, less the water content.

Calculating Volatile %:

ASTM D2369 "Volatile Content of Coatings" procedure is used for the purpose of calculating the volatile organic content (VOC) in solvent-reducible and water-reducible coatings and fluids under specified test conditions. The inverse value, nonvolatile, is used to determine the weight percent solids content. This information is useful to the producer, user and to environmental interests for determining the volatiles emitted by coatings or fluids into the air.

In ASTM D2369, a 0.5-gram sample is heated at 110±5°C for 60 minutes. The percent volatile is calculated from the loss in weight. The total water value is then subtracted from the calculated percent volatile value to obtain the volatile content.

Calculation for percent volatile matter, V, in liquid samples as follows:

$$\% V = 100 - [(W2 - W1/S) \times 100]$$

Where: W1 = weight of aluminum dish

W2 = weight of dish plus specimen after heating to 110°C for 60min

S = specimen weight

$$\%VOC = \%V \text{ total} - \text{water content of sample}$$

Example calculation for CIMPERIAL[®] 1070 concentrate:

$$0.9960 = W1$$

$$+ 0.4850 = S$$

$$= 1.4810 \text{ Dish} + 1.4021 W2$$

$$\%V = 100 - [1.4021 - 0.9960 / 0.4850 \times 100]$$

$$100 - [0.4061 / 0.4850 \times 100]$$

$$100 - [83.73 \times 100]$$

$$100 - [83.73]$$

$$16.27$$

$$\%VOC = 16.27 - 6.03 (\text{total water content CIMPERIAL[®] 1070})$$

Answer: 10.24% VOC

Note: It is not appropriate to figure %VOC by adding up the volatile ingredients for the materials found in the fluid formulation since volatile content of a mixture is not an additive process.

The Volatile Organic Content (VOC) data for CIMCOOL[®] products may be found in Section 11 of the respective CIMCOOL[®] Material Safety Data Sheet

References

1. ASTM International
<http://www.astm.org/>
2. U.S. Environmental Protection Agency (EPA)
<http://www.epa.gov/>