

CIMCOOL® Technical Report

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Metalworking Fluids & Volatile Organic Compounds (VOC)

The Clean Air Act

The current United States 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.

What Are 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. The United States Environmental Protection Agency (EPA) defines Volatile Organic Compounds (VOCs) as "... any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions."¹

In general, VOCs are characterized by high vapor pressures and low boiling points under ambient conditions. As a result of VOCs being potent precursors of photochemical reactivity, which contribute to tropospheric ozone (leading to smog pollutants), various federal, state, and local air quality standards have been passed to reduce ozone levels. EPA's Clean Air Act states goals to reduce VOC emissions.

Volatile Organic Content & Metalworking Fluids

The United States Environmental Protection Agency (EPA) applies Method 24 for determining the VOC of water based metalworking fluids. EPA Method 24 is the method that has been used to measure VOCs in MWF for many years, although, it is primarily suited for VOC determinations in paint, varnish, lacquer, and related coatings.²

ASTM D2369-01e1 is the Standard Test Method for Volatile Content of Coatings. ASTM D2369-01e1 references EPA Method 24 for the determination of the weight percent of volatile ingredients in the fluid. 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.

Prior to 2010, quantitative VOC methods were not specified for water-based metalworking working fluids (MWF). In 2010, the *American Society for Testing and Materials* (ASTM) approved a VOC analytical method (ASTM E1868-10) based on Thermogravimetric Analysis (TGA) that provides more accurate and reproducible data from MWF samples.⁴ The ASTM E1868-10 Method determines the mass of volatile material driven off sample material at specified temperature and time (i.e. 110 minutes @ 81 °C) which is reported in units of grams/liter (g/L). This method was promulgated in response to regulatory initiatives in the California *South Coast Air Quality Management District* (SCAQMD) for limiting VOC emissions from MWF-related products used in industrial facilities.⁵

Further information regarding compliance with California SCAQMD Rule 1144 Metalworking Fluids and Direct Contact Lubricants can be found at <http://www.arb.ca.gov/DRDB/SC/CURHTML/R1144.PDF>.

VOC Content information for CIMCOOL® products can be found in **Section 11 & 14** of CIMCOOL® Material Safety Data Sheets (MSDS) or **Section 9 & 15** of CIMCOOL® Safety Data Sheets (SDS).

References

1. U.S. Environmental Protection Agency (EPA) <http://www.epa.gov/>
2. U.S. EPA. Method 24 – Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings.
3. American Society for Testing of Materials. ASTM D2369-10e1, Standard Test Method for Volatile Content of Coatings.
4. ASTM. 2010. Standard Test Method for Loss-On-Drying by Thermogravimetry. ASTM E1868-10.
5. South Coast Air Quality Management District (SCAQMD). 2009. Rule 1144, Metalworking Fluids and Direct-Contact Lubricants.