



# BULLETIN

## MADISON CHEMICAL INDUSTRIES INC.

### Info Tech Bulletin # 16

## AIR QUALITY REGULATIONS

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## **Introduction:**

Air quality regulations, as they relate to the coatings industry, encompass two main areas: Volatile Organic Compounds (“VOCs”) and Hazardous Air Pollutants (“HAPs”). In this bulletin, we will provide the reader with a short history in the U.S.A. (which has the most advanced regulations in this regard), followed by discussions of VOCs, the related subject of ground level ozone and finally a discussion of HAPs.

## **History:**

1966 – Rule 66, issued by the Los Angeles Air Pollution Control District, is the first air quality regulation to limit the emission of photochemically reactive solvents. The West Coast, with Los Angeles as the forerunner, started a trend which has now spread across the United States.

1970 Clean Air Act was enacted by US congress, created the federal Environmental Protection Agency (EPA) and made it responsible for implementing the requirements of the act and its amendments.

1977 The Clean Air Act and its amendments set deadlines for the EPA, states, local governments and businesses to reduce air pollution. Each state is required to develop a plan that explains the actions it will take to meet or maintain the air quality standards set by the EPA. A state implementation plan (SIP) is a collection of the regulations the state will use. The EPA must approve each state's SIP. The EPA assists the states by providing scientific research, expert studies, engineering designs, and money to support clean-air.

## **What are VOC's?**

"VOC" stands for "Volatile Organic Compound" generally defined as any compound of carbon (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates and ammonium carbonate) that participates in atmospheric photochemical reactions and has a vapor pressure of 0.01 kPa or greater at 77°F (25°C). In more lay language, VOCs are organic chemicals that evaporate quickly at normal room temperature and pressure, and that therefore have what is called “high vapor pressure”.

For practical purposes, VOC means "solvent". The VOC content of a coating is high when the solvent content is high, and the solids content is low. So lacquers have high VOC content, and high solids 2-pack systems have a lower VOC content.

EPA has published a list of “exempt” solvents that have negligible photochemical reactivity. Included in the list are acetone and methylene chloride.

## **Ozone**

Ozone is a gas composed of three atoms of oxygen. Ozone occurs both in the Earth's upper atmosphere and at ground level. Ozone can be good or bad, depending on where it is found.

### ***Good Ozone***

Good ozone occurs naturally in the upper atmosphere, 6 to 30 miles above the Earth's surface, where it forms a protective layer that shields us from the sun's harmful ultraviolet rays. This beneficial ozone is gradually being destroyed by human-made chemicals. When the protective ozone layer has been significantly depleted — for example, over the North or South Pole — it is sometimes called a “hole” in the ozone layer.

### ***Bad Ozone***

In the Earth's lower atmosphere, near ground level, ozone is formed when pollutants emitted by cars, power plants, industrial boilers, refineries, chemical plants, and other sources chemically react in the presence of sunlight. Ozone at ground level is a harmful air pollutant.

Ground-level ozone, which is the main component of urban smog, is formed by the photochemical reaction of volatile organic compounds (VOCs) and nitrogen oxides (NO<sub>x</sub>) in the atmosphere. Smog is a mixture of ground level ozone and microscopic airborne particles.

Ozone pollution is a concern during the summer months when the weather conditions needed to form it — lots of sun, hot temperatures — normally occur. Although these precursors often originate in urban areas, winds can carry NO<sub>x</sub> hundreds of miles, causing ozone formation to occur in less populated regions as well.

### **Regulations to Control Ground Level Ozone:**

In order to reduce ozone levels, the Clean Air Act regulates man-made emissions of both VOCs and NO<sub>x</sub>.

In the United States, areas of the country that do not meet national standards for ground-level ozone are referred to as “ozone non-attainment areas”. Under the

Clean Air Act, these areas generally are required to reduce VOC emissions within their boundaries (not including vehicle emissions) by 3 percent each year until the national standard is met.

In order to reduce ozone levels, federal and state agencies have developed regulations to reduce VOC emissions from a variety of sources, including products that contain solvents. In some cases, for major coating operations, for example, these regulations require the installation of a control device such as an incinerator or a solvent recovery system. In other cases, they limit the amount of solvent that can be used in products but do not prohibit their use.

In most cases, a specific set of regulations has been or will be developed for each different industry or type of emission source. For industries that use solvents in coatings, the regulations often set emission standards based on the VOC content of these coatings. Typically, the State or local agency will issue regulations limiting VOC emissions – often based on EPA guidance. In some cases, however, the Clean Air Act authorizes EPA to issue regulations. For example, EPA has promulgated regulations limiting the VOC content of architectural coatings, automobile refinish coatings and certain household consumer products such as cleaning products, personal care products, and insecticides.

## **What are HAPs**

HAPs are different from VOCs. Hazardous air pollutants (HAPs) or air toxics are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. Air toxics may also cause adverse environmental and ecological effects. Most air toxics originate from human-made sources, including mobile sources (e.g., cars, trucks, construction equipment), stationary sources (e.g., factories, refineries, power plants), and indoor sources (e.g., some buildings materials and cleaning solvents).

EPA regulates 188 specific hazardous air pollutants (HAPs). The list of HAPs is available at the EPA website.

## **Differences between HAP Regulations and VOC Regulations**

HAP regulations typically apply nationwide to facilities that have the “potential to emit 10 tons or more per year of one HAP or 25 tons or more per year of all HAPs. VOC regulations, on the other hand, generally apply only to emitters in non-attainment areas.

HAP regulations under the Clean Air Act are set by the EPA, although many states also operate their own air toxics programs pursuant to state environmental statutes. Most VOC regulations are set by state or local regulatory agencies-- often based on guidance from the EPA, although as noted above, EPA has set national standards for VOC content of architectural coatings and a few other product categories. Other regulations may be available, Check with EPA for the most up-to-date guidance and regulations

### **VOC: - Units of Measure**

Two types of units are used to specify the VOC content of paint:; (1) grams of VOC per litre (g/l) of paint; (2) pounds of VOC per gallon (lb/gal) of paint . These are different ways of expressing the same thing and you can convert from one to the other using the factor 119.8 e.g. 5 lb/gal is the same as 600 g/l ( $119.8 \times 5 = 599$ ).

### **Options for Complying with VOCs and HAPs Regulations**

Solvent users generally have three choices for complying with new VOCs and HAPs regulations:

- (1) Switch to an alternative technology which often provides substantial reductions in both VOC and HAP emissions., example of alternative technologies are; 100% solids solvent free coatings, water based coatings or powder coatings.
- (2) Reformulate current solvent borne coatings using alternative solvents or solvent blends. The use of VOC-exempt solvents and low density solvents are most useful in reducing VOC of a coating. Product performance may be compromised or costs may increase as a result of reformulation. Reformulation may not provide a long-term solution if additional solvents are added to the HAP list In most cases, reformulation does not require significant operational changes.
- (3) A facility always has the option to install control recovery technology or emission control equipment to meet the regulations. Installation of control technology usually requires a significant up-front capital investment. Where a control device is not feasible (either technically or economically), the rules typically establish a limit on the amount of HAP solvents that a specific type of coating may contain.

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