Air Matters

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Toxic Air Pollution in Vermont

When you breathe, life-giving oxygen flows into your lungs. Unfortunately, in that same breath you inhale other chemicals known as "air toxics," also referred to as hazardous air pollutants (HAPs). These air toxics are unhealthy, airborne wastes from many products, services, and industrial processes. The long-term effect of breathing these substances is an increase in the risk of cancer or other serious health problems.

In the 1980s, serious industrial accidents heightened public concern over the dangers of air toxics. At the same time, researchers warned that exposure to very small amounts of toxic chemicals could cause long-term health problems. As a result, citizens demanded protection and control over the release of air toxics.

Toxic air pollutants may exist as particulate matter or as gases. Toxic air pollutants include metals, other particles, gases adsorbed on to particles, and certain vapors from fuels and other sources. An example of such a pollutant is the chemical benzene, which is found in gasoline. Inhaling fumes that contain benzene could increase your risk of getting cancer.

Other less measurable effects of exposure to air toxics include immunological, neurological, reproductive, developmental, and respiratory problems. Pollutants deposited onto soil or into lakes and streams affect ecological systems and eventually human health through consumption of contaminated food or water.

The Clean Air Act, as amended in 1990, directs EPA to set standards requiring companies to sharply reduce routine emissions of toxic air pollutants. EPA is required to establish and phase in specific performance based standards for all of the industries that emit one or more of the pollutants in significant quantities.

The contents of this fire include many toxic substances. The fire in an open pit never gets hot enough to destroy the dangerous chemicals that are released as solid materials are converted into smoke.

This issue of Air Matters explores Vermont's hazardous air contaminant monitoring program, explains air toxics classifcations and risks, and gives recommendations for future actions that will improve the quality of Vermont's air.

AIR MATTERS

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Introduction

During the 1980s, Vermonters expressed growing concern over the potential health and environmental effects of unregulated toxic air pollutants in the state's air-shed. Responding to this concern, the Vermont Agency of Natural Resources proposed regulations for the control of hazardous air contaminants. One aspect of these regulations required a source to determine its own emissions and effect on air quality, and then to add these emissions to existing levels in order to determine if the source in question "caused or contributed to" a violation of the state ambient air quality standard for a hazardous air contaminant.

To address difficulties in implementation surrounding this provision, two actions were taken in 1993. First, after much public deliberation, the Agency amended the regulations and suspended the requirement to consider existing air quality. This suspension was for a five year period, pending a review of the air quality standards for hazardous air contaminants. This review was to be conducted based on the best available scientific information on health effects and risk, and the achievability of these ambient air standards. All parties agreed more information was needed on existing levels of air toxics throughout the state of Vermont.

In response to the need for more air toxic data in ambient air, the second action was the establishment of the Hazardous Air Contaminant Monitoring Program. Act 92 of the 1993 Adjourned Legislative Session

directed the Agency to establish a Hazardous Air Contaminant Monitoring Program with the following goals: (1) Measure the presence of hazardous air contaminants in ambient air; (2) Identify sources of hazardous air contaminants; (3) Assess human health and ecological risk to focus studies on those air contaminants which pose the greatest risk; (4) Gather sufficient data to allow the Secretary to establish appropriately protective standards: and (5) Ensure adequate data are collected to support the state's operating permit program.

Act 92 provided funding for this effort by placing a surcharge on motor vehicle registrations beginning January, 1994, and a surcharge on industrial emissions based on the toxicity of chemicals emitted.

Review of Hazardous Ambient Air Standards

To assist in the first action of reviewing the methodology used to derive the ambient air standards for toxic pollutants, the Agency appointed a Toxicological Advisory Committee. The Committee consists of toxicologists and scientists from varying backgrounds, representatives of the state's Department of Health and Department of Environmental Conservation, and representatives of the major interest groups involved with the air toxic program, including the Vermont Public Interest Research Group and the Associated Industries of Vermont.

The Committee has reviewed the methodology for deriving the Hazardous Ambient Air Standards (HAAS) for Categories I, II and III. Category I compounds are those Hazardous Air Contaminants identified as potentially carcinogenic by the United States Environmental Protection Agency (US EPA) or International Agency for Research on er (IARC) or reported to induce cancer in two or more tests performed by either the National Toxicological Program (NTP) or National Cancer Institute (NCI).

Category II compounds are noncarcinogens with potential chronic/ systemic effects due to long-term exposure, and Category III compounds are noncarcinogens considered to have primarily short-term irritant effects.

An air quality technician with the state's air pollution control division services an air monitoring device atop the air monitoring trailer in Burlington.

EPA Study Finds Toxic Air Pollutant Levels High Across the Country

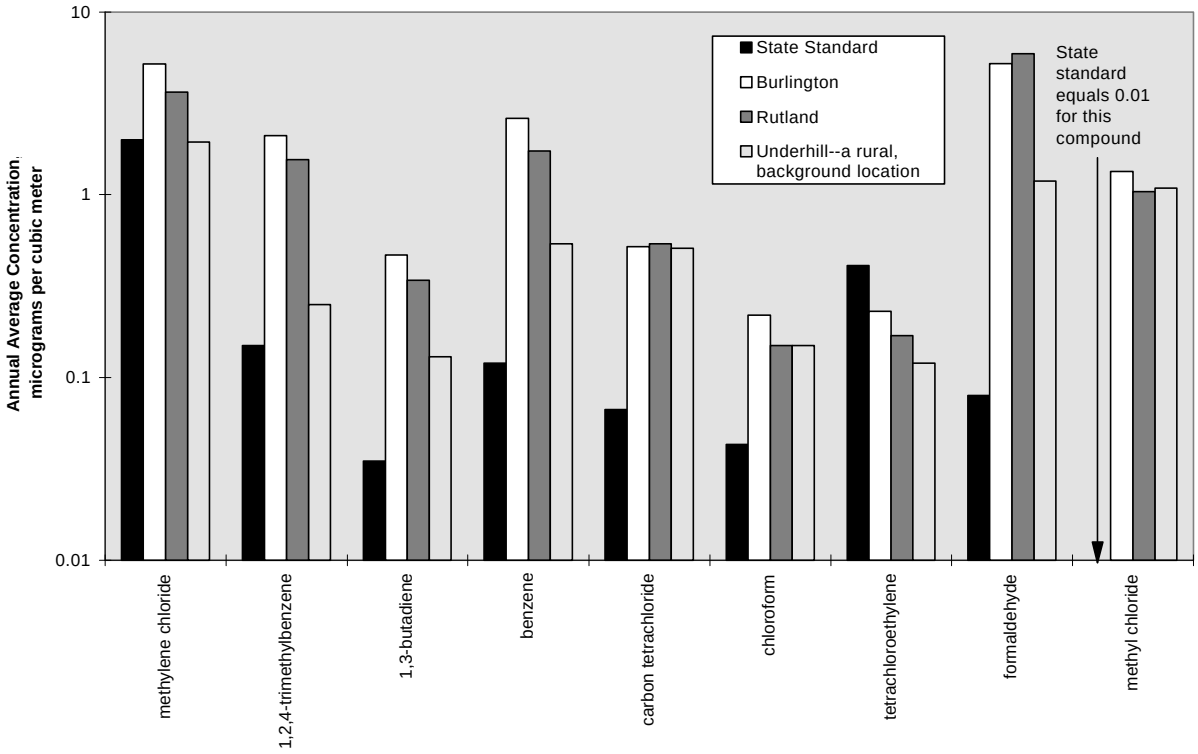
A recent study conducted by the U.S. Environmental Protection Agency (EPA) suggests that concentrations of seven toxic air pollutants (benzene, carbon tetrachloride, chloroform, ethylene dibromide, ethylene dichloride, formaldehyde and methyl chloride) are present in concentrations which exceed health-based protective thresholds in rural, urban and suburban communities across the country, including Vermont. Toxic air pollutants include those that are known or suspected to cause cancer or other serious health effects, such as birth defects or reproductive effects. EPA's study, the Cumulative Exposure Project (CEP), was designed to estimate through the use of a computerized model the amount of toxic pollution in the air, based on 1990 data. The results of the study can be seen at internet website **www.scorecard.org** By entering your zip code into a data field you can find out what toxic pollutants are being released into your community and where they are coming from.

More information on toxic air pollution can be found at:

www.epa.gov/region01/eco/airtox/index.html

www.epa.gov/cumulativeexposure/

1995 Annual Average Concentrations of Various Volatile Organic and Carbonyl Compounds, Including Respective State Standards



This bar graph indicates the level of various toxic pollutants relative to the current state standards. These concentrations were measured in Burlington, Rutland and Underhill in 1995. The state standard for each of the pollutants is represented by the solid black bar.

Proposed Modifications for Determining Category I Compounds

After reviewing the regulations, the committee recommended modifying the criteria for placing a chemical in Category I. The committee proposes that a chemical be placed in Category I if it is identified as potentially carcinogenic by the US EPA or IARC and may be considered for inclusion if positive tests in two or more species are reported by NTP.

There are currently 54 compounds on the Category I list. The Agency has determined that all but six compounds (arsine, 1,1-biphenyl, diazomethane, methyl bromide, methyl iodide and propylene imine) of the current Category I compounds meet the above proposed revised requirements for classification as a Category I contaminant. The committee recommends that these six compounds be removed from Category I and be placed in Category II. Standards for the remaining 48 Category I compounds have been updated using the most current toxicity information.

The Agency has determined that 14 compounds currently classified as Category II or III meet the proposed revised criteria for classification as Category I. A majority of the committee proposes that these 14 compounds be placed on Category I and the standards be updated using the Category I methodology.

Hazardous Air Contaminant Monitoring Program

In order to compare ambient air levels to the standards, the Agency has reviewed air monitoring data from 1993 to 1995. The data show that there are nine compounds whose air concentrations are consistently above the current standards. Those compounds are benzene, 1-3 butadiene, carbon tetrachloride, chloroform, formaldehyde, methyl chloride, methylene chloride, tetrachloroethylene, and 1,2,4-trimethyl benzene. Due to public concern, the Agency is also keeping a close eye on levels of styrene, acrolein and mercury. Based on updated toxicity information, current air concentrations of tetrachloroethylene and

1,2,4-trimethyl benzene would no longer exceed the proposed revised standards. However, acrolein's concentrations would now exceed the proposed revised standard. Out of the eight compounds that would consistently exceed the proposed revised standard, five are considered to be generated locally, and three are considered to be transported from other areas. The local pollutants are benzene, 1,3-butadiene, formaldehyde, methylene chloride and acrolein. The transported pollutants are carbon tetrachloride, chloroform, and methyl chloride. Of the locally generated compounds listed above, benzene, 1,3-butadiene, formaldehyde, and acrolein are all byproducts of incomplete combustion.

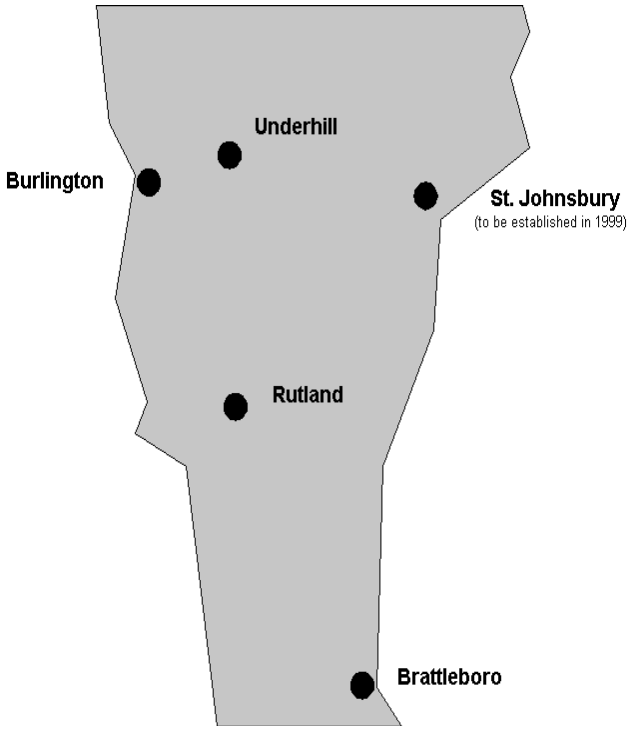
A toxic brew of of arsenic, cadmium, chromium and zinc was released into the atmosphere during a purposely set tire fire. The tires are no longer visible, but they exist as poisonous gases that contaminate our air, soil, and ground water.

Discussion of Risk

The Agency has the legal responsibility for public health protection from outdoor exposures to toxic air pollutants. To carry out this responsibility the Agency has established ambient air standards adequate to protect public health with an ample margin of safety. For carcinogens, where it is assumed there is no absolutely risk-free level of exposure, it becomes necessary for the Agency to establish a maximum allowable level of incremental lifetime carcinogenic risk (hereafter incremental lifetime carcinogenic risk is referred to as "risk"). This maximum allowable level of risk represents a negligible increase in potential risk over background risk over a lifetime of exposure, for the population of concern. Various federal and state agencies employ different levels of maximum allowable risk or negligible risk. Values between one in one million (1×10^{-6}) to one in ten thousand (1×10^{-4}) are typically used. The maximum allowable level of risk is a risk management decision that must be made by the Agency of Natural Resources, in consultation with the Department of Health. The committee is not recommending any specific risk level at which ambient standards should be established. However, the committee does agree

Hazardous air pollutants do not always come in the form of ugly black smoke. While the discharges from the stacks in this photo do not appear to be out of the ordinary, the emissions are actually quite toxic. Sometimes what you can't see can hurt you.

Vermont Air Toxics Monitoring Sites



that $1x10^{-6}$ is a negligible risk.

Deciding what amount of potential risk is to be considered negligible is a complex task. However, whether or not it is acceptable to allow additional emissions even at this negligible level should depend on a consideration of existing ambient air quality. For example, if risk associated with inhalation of existing ambient air is estimated to already be highly elevated, above $1x10^{-4}$ for example, it may not be appropriate to allow additional emissions, even at the $1x10^{-6}$ level, without further investigation.

Controls Currently in Place

While it is recognized that there is much to be done in controlling toxic air pollutants, Vermont has already implemented some programs to help reduce their emissions. These current programs deal with automobiles.

Stage I and II vapor recovery systems (as illustrated on page 7) are already in place at many service stations, and installation of the Stage II systems will continue through the year 2000. Stage I and II control technology helps to keep harmful gasoline vapors from entering the atmosphere by trapping them in a closed-loop system.

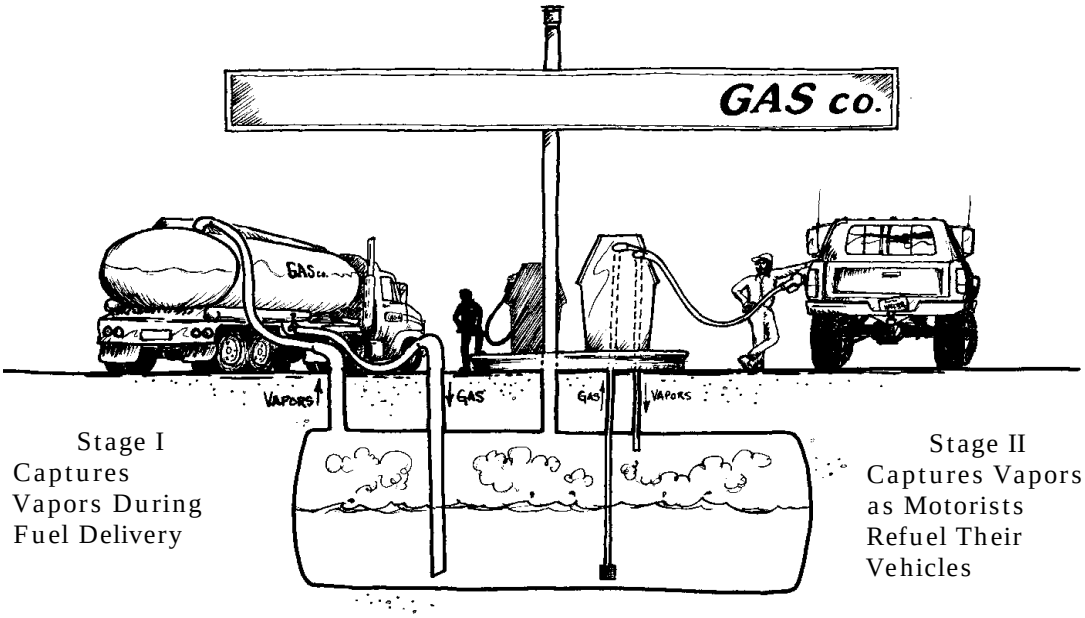
The current inspection and maintenance program for Vermont automobiles will provide residual benefits in the reduction of air toxic pollutants. In conjunction with annual safety inspections, Vermont vehicles must also be checked for properly functioning air pollution control equipment.

Vermont has also adopted regulations that require the sale of the lowest emission vehicle which the auto manufacturers have in mass production beginning with model year 2000.

Recommendations for Future Actions

The Air Pollution Control Division is exploring a number of options to further control hazardous air pollutants. One area where significant reductions can be achieved is diesel exhaust from heavy duty vehicles. Vermont's Air Pollution Control Division has been piloting a program which randomly tests these vehicles to see if they are emitting excessive amounts of smoke. It is called the Heavy Duty Diesel Testing Program. Drivers

Electric vehicles, such as the Solectria Sunrise in this photograph, may provide a partial solution in efforts to reduce hazardous air pollutants.



Stage I & II vapor recovery systems allow delivery trucks to fill underground storage tanks and consumers to fill their motor vehicle fuel tanks without being exposed to harmful gasoline vapors.

whose vehicles are tested receive a written copy of the test results which can be used by mechanics to repair engines with poor performance.

In the Northeast, heavy-duty diesel vehicles (those weighing more than 8,500 pounds) make up only 2 percent of the vehicle population, yet they account for approximately 33 percent of all emissions of nitrogen oxides (NOx) and 75 percent of all mobile source related emissions of particulate matter. Scientists and health care professionals have become very concerned about the health effects from direct contact with carcinogenic byproducts of diesel combustion and particulate matter. Studies show that exposure to diesel particles has resulted in an increase in cancers among occupationally exposed workers. Nitrogen oxides from diesel exhaust contribute to the formation of ground level ozone which in turn can cause detrimental health effects such as lung damage and aggravation of respiratory disease. By identifying and repairing vehicles which emit excessive pollution, significant reductions in these air pollutants can be achieved.

This photograph captures diesel exhaust at the point of acceleration. Had the truck been in tune the smoke would have been almost invisible.

The data from the testing effort have shown that new, well-maintained vehicles are quite clean and that older vehicles, on average, are considerably dirtier. The Air Pollution Control Division is compiling a report summarizing options for testing requirements for heavy-duty diesel vehicles, as there is clear evidence that such a program would be effective in reducing excessive diesel emissions. Most likely, a recommendation for annual testing, or random roadside testing will be made. A properly maintained, clean-burning diesel engine saves the owner money by decreasing fuel costs and extending the life of the engine. A clean running diesel engine will also help protect the public from unnecessary diesel exhaust emissions which can be a significant health hazard.

Conclusion

While Vermont implements new programs to protect the public from toxic air pollutants, it will continue to monitor the air to determine if its strategies are working and to develop plans to reduce pollutants that are consistently above the standards.

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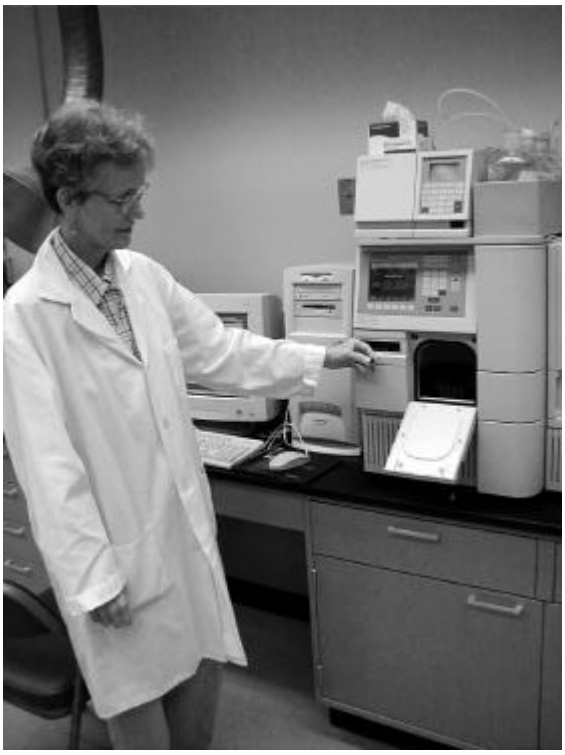

An in-house capability to analyze toxics samples is being developed by the Vermont Department of Environmental Conservation Laboratory. Until now, toxics samples have been sent to an out-of-state laboratory for analysis. At left, Department employee Sandy Lewis loads a sample into a high performance liquid chromatograph. At right, co-worker Linda Van Vechten loads sampling canisters into a cleaning device.