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United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park, NC 27711

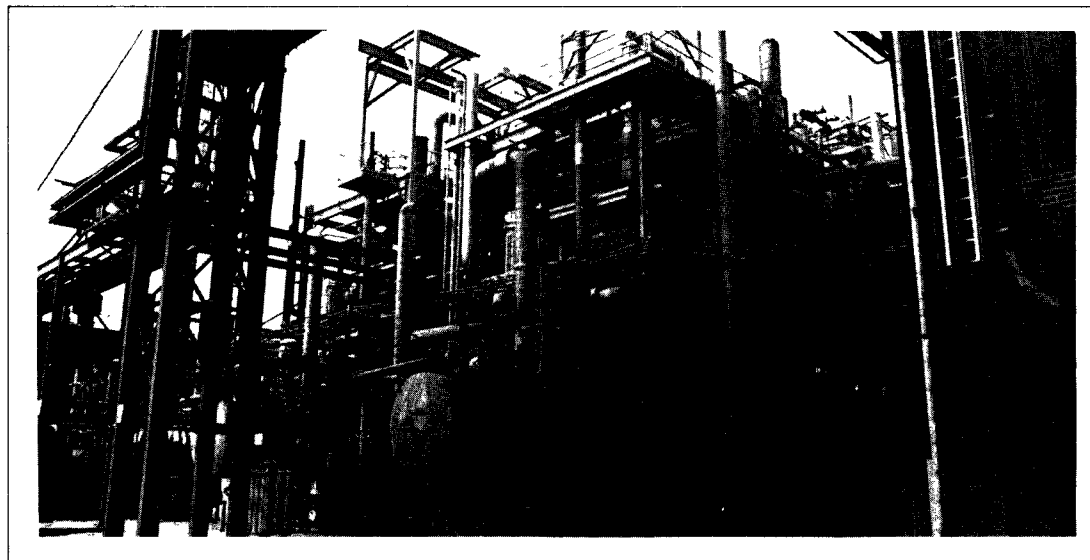
May
1980

National Emission Standards for Hazardous Air Pollutants



Benzene Emissions from Maleic Anhydride Plants

Proposed Regulation



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**National
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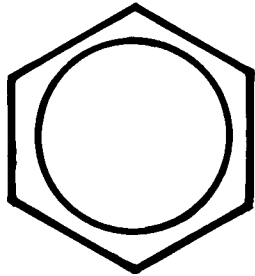
The Clean Air Act as amended in 1977 requires a comprehensive national program for reducing air pollution and improving air quality. Section 112 of the Act authorizes EPA to establish National Emission Standards for Hazardous Air Pollutants (NESHAPS). Hazardous air pollutants being considered for NESHAPS regulation are defined by the Act as substances (1) to which no ambient air quality standard is applicable and (2) that may reasonably be anticipated to result in an increase in mortality, in serious irreversible illnesses, or in incapacitating, reversible disorders. Each standard is to be set at a level that provides,

in the judgement of the Administration, an ample margin of safety to protect the public health. NESHAPS immediately apply to new sources upon promulgation and to existing sources within 90 days, though under special circumstances existing sources may be given up to two years to comply. Each state may develop and submit to EPA a procedure for implementing and enforcing NESHAPS for stationary sources located within the state, which EPA will review for efficacy. EPA is now proposing a NESHAPS for benzene emissions from the process vents of maleic anhydride plants.

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Benzene

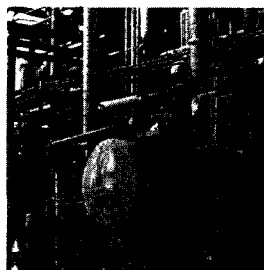


Benzene was listed as a hazardous air pollutant by EPA on June 8, 1977. Studies of industrially exposed workers have shown that benzene is causally related to the induction of a number of blood disorders. Among these diseases are leukemia (a cancer of the hematopoietic, or blood-forming, system), various cytopenias (decreased levels of formed elements in the circulating blood, such as red cells, white cells and

platelets), aplastic anemia (a non-functioning bone marrow), and potentially inheritable chromosomal aberrations. The severity of hematopoietic diseases ranges from mild and episodic to chronic and fatal.

The proposed NESHAPS would reduce the risk of leukemia to individuals exposed to benzene emissions from maleic anhydride process vents. The estimated maximum lifetime risk of leukemia to the most-exposed individuals would be reduced from a range of 1 chance in 1,600 to 11,000 to a range of 1 chance in 29,000 to 200,000.

Maleic Anhydride Plants



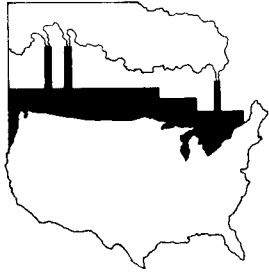
EPA established initial priorities for stationary sources of benzene emissions according to maximum risk and cancer incidence, estimated from ambient exposures caused by such sources. When these two factors are weighed together, maleic anhydride process vents rank as one of the higher priority sources of benzene for regulation. Benzene is used as a feedstock in the production of maleic anhydride and/or lesser amounts of maleic acid.

Stationary sources account for 20 percent of the total benzene emissions released in the United States, with the remaining 80 percent due to mobile sources. Maleic

anhydride plants are by far the largest single source of benzene emissions in the chemical industry, discharging 35 percent of all benzene emitted by stationary sources.

The benzene emissions specifically affected by the proposed regulation would be those released from the vents of the maleic anhydride production unit. This unit contains several components: one or more reactors, a product recovery absorber (whose vent releases over 98 percent of the total benzene emissions from a maleic anhydride plant), and a refining system. The rulemaking would be applicable to all production units manufacturing over 500 megagrams (550 tons) of maleic anhydride and/or maleic acid per year, a level of production that distinguishes commercial-sized plants from laboratory facilities.

The Proposed Standard for Limiting Emissions



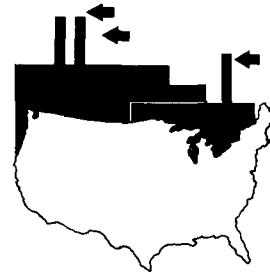
The proposed regulation would apply to all existing and new maleic anhydride production units. It would require 97 percent control of benzene emissions from existing sources (or units) and 100 percent elimination of benzene emissions from new sources. The permissible limit of benzene discharges into the atmosphere from the process vents of existing sources would be 0.30 kg benzene per 100 kg benzene fed to the reactor(s). New sources would achieve 100 percent control of benzene emissions through substitution of benzene with another feedstock, such as n-butane.

The proposed standard would not allow emissions in excess of the numerical emission limit except when a sudden and un-

avoidable failure of air pollution control equipment occurs. During such a failure, the emissions could not exceed the amount that would be released in the process of shutting down the plant. Emissions could generally be kept below this level during control equipment failures by modifying plant operations, but in cases where emissions would still exceed the level released during shutdown (such as during lengthy repairs), plant operations would have to cease. The total quantity of uncontrolled emissions calculated to occur during a typical shutdown procedure is 250 kg (550 lb) for a typical plant with a capacity of 25,000 tons per year and three reactors.

Owners and operators of all maleic anhydride plants using benzene as a feedstock would also be required to install continuous monitoring systems and report any emissions in excess of the numerical emission limit.

Achieving and Maintaining the Standard



The proposed standard for existing sources, which is based on best available technology for reducing benzene emissions (considering environmental, economic and energy impacts), can be achieved through add-on controls, such as thermal incineration or carbon adsorption systems. Neither of these methods is specifically required by the proposed standard, but both have been proven as viable means to curb emissions.

The proposed standard for existing sources, which is based on best available technology for reducing benzene emissions (considering environmental, economic and energy impacts), can be achieved through add-on controls, such as thermal incineration or carbon adsorption systems. Neither of these methods is specifically required by the proposed standard, but both have been proven as viable means to curb emissions.

For new sources, the benzene feedstock would be substituted entirely, resulting in 100 percent control of benzene emissions. Although the proposed standard technically applies to all maleic anhydride plants, those plants not using benzene as a feedstock are exempt from the requirements for initial testing, continuous monitoring, or reporting of excess emissions set forth by the proposed standard.

Continuous monitoring systems, such as gas chromatography with flame ionization detection, would be used to indicate compliance with the standard.

Impacts

**Environmental:**

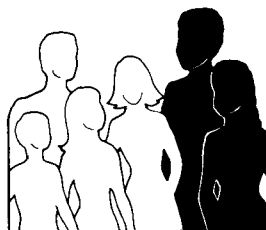
Nationwide annual reductions of benzene emissions from maleic anhydride plants, operating at full capacity, would be 4,900 megagrams (from 5,800 to 900 Mg) or 5,400 tons (from 6,400 to 990 tons). These reductions would be achieved with minimal adverse impacts to other aspects of the environment, although small increases in NO_x and SO_x emissions to the atmosphere would occur if control by thermal incineration were used. Also, small increases in solid waste and benzene could occur in wastewater if carbon adsorption were used.

Energy: For the existing maleic anhydride plants, nationwide energy requirements to control emissions would be expected to approximate 50,000 barrels of fuel oil per

year. To comply with the proposed standard, a typical, uncontrolled plant operating at full capacity would increase its energy consumption by approximately 10,500 barrels per year.

Economic/Industrial: In the first two years of compliance with the proposed standard, the domestic maleic anhydride industry would need a capital investment of about \$6.6 million. The annualized costs for the industry would increase by about \$2.5 million per year by the fifth year, and maleic anhydride prices would increase up to 1.2 percent overall. In addition, during control system malfunctions, production levels may be decreased in order to meet the standard. A typical plant, with an annual capacity of 22,700 Mg (25,000 tons), could lose between 15 to 42 hours of production time per year, at an estimated cost per hour of \$1,000 to \$1,500.

Public Participation



A public hearing on the proposed regulation is scheduled for May 20, 1980, beginning at 9:00 a.m., at the Olde Colony Motor Lodge, 625 First St., Alexandria, Virginia. Invited to participate are individuals who wish to present additional data, views, or other comments concerning this NESHAPS regulation, the listing of benzene as a hazardous pollutant, or the health effects associated with benzene emissions from maleic anhydride plants. If you wish to speak at the hearing, contact Ms. Deanna Tilley, Emission Standards and Engineering Division (MD-13), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, telephone 919/541-5477 by May 13, 1980.

Written comments will be accepted on or

before June 17, 1980, and should be submitted in duplicate and addressed to Central Docket Section (A-130), Attention: Docket Number OAQPS 79-3, U.S. Environmental Protection Agency, 2903B Waterside Mall, 401 M Street, SW, Washington, DC 20460. The docket contains all information considered by EPA during the development of this standard and is open for inspection. The supporting background documents for the proposed standard may be obtained from the EPA Library (MD-35), Research Triangle Park, North Carolina 27711, telephone 919/541-2777. Refer to: Benzene Emissions from Maleic Anhydride Plants—Background Information Document for Proposed Standard, Assessment of Health Effects of Benzene Germane to Low-Level Exposures, Assessment of Human Exposures to Atmospheric Benzene, and Carcinogen Assessment Group's Report on Population Risk to Ambient Benzene Exposures.

**Status of
Regulation**

The proposed standard was published in the *Federal Register* on April 18, 1980. A public hearing is scheduled May 20, 1980,

and the final regulation is scheduled for publication in February 1981.

EPA is charged by Congress to protect the Nation's land, air and water systems. Under a mandate of national environmental laws focused on air and water quality, solid waste management and the control of toxic substances, pesticides, noise and radiation, the Agency strives to formulate and implement actions which lead to a compatible balance between human activities and the ability of natural systems to support and nurture life.

If you have suggestions, questions or requests for further information, they may be directed to your nearest EPA Regional public information office.

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