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Benzene Emissions From Benzene Storage Vessels; Proposed Rule and Notice of Public Hearing

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 61

[AD-FRL-1609-8]

Benzene Emissions From Benzene Storage Vessels; National Emission Standard for Hazardous Air Pollutants; Hearing

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed Rule and Notice of Public Hearing.

SUMMARY: The proposed standard would limit benzene emissions from each new and existing storage vessel with a capacity greater than 4 cubic meters used to store pure benzene. Each new and existing benzene storage vessel would be required to have a fixed roof in combination with an internal floating roof that rests on the liquid surface inside the storage vessel. Each storage vessel would also have to be equipped with a liquid-mounted primary seal and a continuous secondary seal. Periodic inspections of the internal floating roof and seals would be required to help ensure that the equipment is being properly operated and maintained.

The proposed standard implements Section 112 of the Clean Air Act and is based on the Administrator's determination of June 8, 1977, that benzene presents a significant carcinogenic risk to human health as a result of benzene emissions to the atmosphere from one or more stationary source categories and is, therefore, a hazardous air pollutant. The intent of the standard is to protect the public health with an ample margin of safety.

A public hearing will be held to provide interested persons an opportunity for oral presentation of data, views, or arguments concerning the proposed standard for benzene storage vessels.

DATES: *Comments.* Comments must be received on or before March 12, 1981.

Public Hearing. A public hearing will be held on February 10, 1981 beginning at 9:00 a.m.

Request to Speak at Hearing. Persons wishing to present oral testimony must contact EPA by February 3, 1981.

ADDRESSES: *Comments.* Comments should be submitted (in duplicate, if possible) to: Central Docket Section (A-130), Attention: Docket No. A-80-14, U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460.

Public Hearing. The public hearing will be held at EPA Administration Bldg. Auditorium, Research Triangle Park, N.C. Persons wishing to present oral testimony should notify Ms. Naomi Durkee, Emission Standards and Engineering Division (MD-13), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, telephone number (919) 541-5331.

Background Information Document. The background information document for the proposed standard is contained in the docket and may be obtained from the U.S. EPA library (MD-35), Research Triangle Park, North Carolina 27711, telephone number (919) 541-2777. Please refer to "Benzene Emissions from Benzene Storage Vessels—Background Information for Proposed Standards," (EPA-450/3-80-034a). Other pertinent documents that may be obtained from this address include: "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."

Docket. Docket No. A-80-14, which contains supporting information used in developing the proposed standard, is available for public inspection and copying between 8:00 a.m. and 4:00 p.m., Monday through Friday, at EPA's Central Docket Section, West Tower Lobby, Gallery 1, Waterside Mall, 401 M Street, S.W., Washington, D.C. 20460. Supplementary information on the regulation of benzene emissions can be obtained from the Maleic Anhydride Docket No. OAQPS-79-3, which is available for public review at EPA's Central Docket Section. A fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: Ms. Susan Wyatt, Emission Standards and Engineering Division (MD-13), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, telephone number (919) 541-5477.

SUPPLEMENTARY INFORMATION: Notice is hereby given that, under the authority of Section 112(b)(1)(B) of the Clean Air Act (as amended), the Administrator is proposing a national emission standard for benzene emissions from benzene storage vessels. The proposed standard has been developed consistent with the EPA "Policy and Procedures for Identifying, Assessing, and Regulating Airborne Substances Posing a Risk of Cancer" (44 FR 58642) proposed on October 10, 1979, although these policy and procedures are not final. As prescribed in Section 112(b)(1)(A) of the Act, the proposal of this standard was preceded by the Administrator's determination that benzene is a hazardous air pollutant as defined in Section 112(a)(1) of the Act. Accordingly, the Administrator revised the list of hazardous air pollutants on June 8, 1977, by adding benzene (42 FR 29332).

A background information document has been prepared that contains information on benzene storage vessels, the available technologies for controlling benzene emissions from these storage vessels, and an analysis of the environmental, energy, economic, and inflationary impacts of the regulatory alternatives. Information on the health effects of benzene is contained in documents prepared by or for EPA entitled the "Assessment of Health Effects of Benzene Germane to Low Level Exposure," the "Assessment of Human Exposures to Atmospheric Benzene," and the "Carcinogen Assessment Group's Report on Population Risk to Ambient Benzene Exposures." The information contained in these documents is summarized in this preamble. All references used for the information contained in the preamble can be found in one of the four documents, except as noted.

Proposed Standard

The proposed standard would apply to each new and existing storage vessel used to store benzene with a specific gravity within the range of specific gravities specified for Industrial Grade benzene in ASTM-D-836-77, and which has a storage capacity greater than 4 cubic meters. It would not apply to storage vessels used for storing benzene at coke oven byproduct facilities because a separate standard is being developed for these storage vessels.

The proposed standard would reduce benzene emissions from the affected storage vessels by requiring that each storage vessel have a fixed roof in combination with an internal floating roof that rests on the liquid surface. It would also require that each internal floating roof have a liquid-mounted primary seal and a continuous secondary seal. Equipment demonstrated to be equivalent in terms of emissions reduction would also be allowed.

To help ensure that the control equipment is being properly operated and maintained, periodic inspections of the control equipment would be required. The internal floating roof, primary seal, and secondary seal would have to be inspected from inside each storage vessel prior to filling of the vessel and at least once every 5 years thereafter. A floating roof having defects or a seal having holes or tears would have to be repaired before the storage vessel could be filled with benzene.

The internal floating roof and the secondary seal would also have to be inspected through roof hatches on the fixed roof at least once every 3 months. As viewed through the roof hatches, if there were product accumulated on or visible defects in the internal floating roof, visible gaps between the secondary seal and the wall of the storage vessel, or holes, tears, or other openings in the secondary seal or the seal fabric, these items would have to be repaired or replaced. All repairs would have to be made within 30 days or the storage vessel would have to be emptied.

Each existing source would have to comply with the standard within 90 days of its effective date, unless a waiver of compliance is obtained. A waiver of compliance could be granted by the Administrator for no more than 2 years from the promulgation date.

Summary of Health, Environmental, Energy, and Economic Impacts

Approximately 500 existing benzene storage vessels would be affected by the standard. These storage vessels are located at 143 facilities including 62 benzene producing facilities (e.g., refineries), 77 benzene consuming facilities (e.g., chemical plants), and 4 bulk storage terminals.

The proposed standard would reduce the national benzene emissions from existing storage vessels from about 2,200 megagrams per year (Mg/year) to about 510 Mg/year. As a result of this emission reduction, the lifetime risk to the most exposed population would be reduced from a range of 1.5×10^{-4} to 1.0×10^{-3} to a range of 2.7×10^{-5} to 1.9×10^{-4}. The projected incidence of excess leukemia deaths resulting from exposure to benzene emissions from existing benzene storage vessels would be reduced from a range of 0.12 to 0.82 deaths per year to a range of 0.03 to 0.20 deaths per year for the 85 million people estimated to live within 20 kilometers of existing benzene storage vessels. A reduction in other health effects associated with benzene exposure (such as ctyopenia, aplastic anemia, and chromosomal aberrations) is also expected.

The proposed standard would also significantly reduce the emissions from new benzene storage vessels. By 1985 there will be an estiamted 168 new benzene storage vessels in use at 49 new facilities. Implementation of the proposed standard would reduce the 1985 emissions from new storage vessels from about 930 megagrams (Mg) to about 170 Mg. This emissions reduction would reduce the lifetime risk to the most exposed population from a range of 1.5×10^{-4} to 1.0×10^{-3} to a range of 2.7×10^{-5} to 1.9×10^{-4}. The projected incidence of excess leukemia deaths in 1985 resulting from benzene emissions from new benzene storage vessels would be reduced from a range of 0.05 to 0.34 deaths to a range of 0.01 to 0.07 deaths. The 1985 emissions from both new and currently existing benzene storage vessels would be reduced from 3,130 Mg to 680 Mg with the adoption of the proposed standard for benzene storage vessels.

The proposed standard would reduce the national benzene emissions with no potential continuous adverse impacts on other aspects of the environment. In addition, there would be no adverse energy impacts associated with the proposed standard.

The capital investment required for an existing model plant to comply with the proposed standard would range from about $33,000 to about $220,000. The net annualized cost, taking into account the value of benzene saved, would range from about $5,000 to about $29,000. The total national capital and annualized costs for existing facilities would be $11 million and $1.6 million, respectively. The price of benzene would increase by a maximum of about 0.1 percent as a result of the proposed standard. No plants are projected to close as a result of implementing the proposed standard.

The capital cost for a new model plant to comply with the proposed standard would range from about $28,000 to about $120,000. The net annualized cost would range from about $2,200 to about $11,000. The total national capital and annualized costs for new facilities constructed through 1985 to comply would be approximately $2.7 million and $260,000 respectively.

Information on Health Effects of Benzene

The Administrator announced in the June 8, 1977, Federal Register his decision to list benzene as a hazardous air pollutant under Section 112 of the Clean Air Act. A "hazardous air pollutant" is defined as an "air pollutant to which no ambient air quality standard is applicable and which * * * may reasonably be anticipated to result in an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness."

Numerous occupational studies conducted over the past 50 years provide evidence of the health hazards resulting from prolonged inhalation of benzene. Benzene has been recognized since 1900 as a toxic substance capable of causing acute and chronic effects. Benzene attacks the hematopoietic system, especially the bone marrow, and its toxicity is manifested primarily by alterations in the level of the formed elements in the circulating blood (red cells, white cells, and platelets). The degree of severity of these effects ranges from mild and transit episodes to severe and fatal disorders. The mechanism by which benzene produces its toxic effects, although under investigation, is still unknown.

The adverse effects on the blood-forming tissues have been documented in studies of workers in a variety of industries and occupations including the manufacturing and processing of rubber, shoes, rotogravure, paints, chemicals, and more recently, natural rubber cast film. These studies include single-case reports, cross-sectional studies, and retrospective studies of morbidity and mortality among a defined cohort of workers industrially exposed to benzene.

Based on the entire set of these studies, the Administrator concluded that benzene exposure is casually related to a number of blood disorders, including leukemia (a cancer of the blood-forming system).[a] Although the studies which form the basis of this conclusion involve industrial exposure to benzene at higher levels than those found in the ambient air, the Administrator has "made a generic determination that, in view of the existing state of scientific knowledge, prudent public health policy requires that carcinogens be considered for regulatory purposes to pose some finite risk of cancer at any exposure level above zero" (44 FR 58646). Because of the widespread use of benzine, benzine emissions in the ambient air have been determined to result in significant human exposure. For these reasons, exposure to benzene emissions may reasonably be anticipated to result in one or more serious effects that can be expected to lead to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness. Therefore, the Administrator concluded that benzene satisfies the definition of a hazardous air pollutant under Section 112 of the Clean Air Act.

Rationale for Regulating Benzine Storage Vessels

Stationary source categories of benzene emissions include fugitive emissions from petroleum refineries and chemical manufacturing plants, the gasoline marketing system, process vents at several types of chemical

[a] Benzene has been shown to be causally related to various cytopenias (decreased levels of formed element in the circulating blood), aplastic anemia (a non-functioning bone marrow), and potentially inheritable chromasomal aberrations.

manufacturing plants, coke oven byproduct plants, and benzene storage and handling facilities.

The first step in establishing standards for benzene emissions was to determine which of the source categories emitting benzene would be regulated. Although a pollutant such as benzene may be considered for regulation under Section 112 of the Clean Air Act because emissions from a particular source category pose a significant risk, other source categories may also emit the pollutant in lesser amounts. This may occur, for example, because the source categories process very little of the substance, because the substance is present in only trace amounts in the sources' raw materials, or because the sources have installed adequate controls on their own initative or in response to other regulatory requirements.

Currently, there are 143 petroleum refineries, chemical plants, and bulk storage terminals that store benzene. At these facilities benzene is stored in either fixed-roof, external floating-roof, or internal floating-roof storage vessels. These storage vessels emit benzene in varying amounts, depending on the type and the size of the storage vessel. Controls are readily available which can significantly reduce benzene emissions from these storage vessels.

There are now about 500 benzene storage vessels in use nationwide. These storage vessels, which include about 180 fixed-roof storage vessels, 30 external floating-roof storage vessels, and 290 internal floating-roof storage vessels, emit an estimated 2,700 Mg/year of benzene. Assuming that all existing fixed-roof storage vessels with capacities greater than 150,000 liters are required to be controlled to the level recommended by the Control Techniques Guideline (CTG) for fixed-roof storage vessels *(Control of Volatile Organic Emissions from Storage of Petroleum Liquids in Fixed-Roof Tanks)* issued in December 1977 (EPA-450/2-77-036), about 140 of the existing fixed-roof storage vessels will have to be fitted with internal floating roofs. This will reduce the nationwide benzene emissions to about 2,200 Mg/year.

By 1985, using a projected industry growth rate of 5 percent per year, there will be an estimated 168 new benzene storage vessels in use. Assuming that all new storage vessels with capacities greater than about 150,000 liters are controlled to the level required by the New Source Performance Standard (NSPS) for Petroleum Liquid Storage Vessels ("Petroleum Liquid Storage Vessels; Standards of Performance for New Stationary Sources") promulgated on April 4, 1980 (45 FR 23374), the nationwide benzene emissions from new storage vessels will be about 900 Mg/year.

Approximately 85 million people live within 20 kilometers of the 143 existing facilities having benzene storage vessels. This is considered the population "at risk" (i.e., the population exposed to ambient concentrations of benzene due to benzene emissions from these storage vessels). As a result of exposure to these benzene concentrations (assuming that existing storage vessels are controlled to the level recommended by the CTG), it is estimated that the maximum lifetime risk to an individual in the exposed population would be within a range of 1.5×10^{-4} to 1.0×10^{-3}. The maximum lifetime risk is the estimated probability that an individual who is exposed continuously for 70 years to the highest maximum annual average ambient benzene concentration due to benzene emissions from benzene storage vessels, will die from leukemia as a result of exposure to these emissions. In addition, it is estimated that there would be a range of 0.12 to 0.82 deaths per year within this population as a result of exposure to benzene emissions from benzene storage vessels. Although the typical operating life of the facilities that may be affected by the proposed standard is difficult to estimate, a 20-year operating life would be common to these industries. Operating lives of 50 years of more may occur, particularly in the petroleum refining industry. However, operating lives may be less than 20 years for some chemical manufacturing industries. On this basis, the estimated number of deaths which would occur over a 20-year operating life of the 143 existing facilities would range from 2.4 to 16.4.

The ranges presented here include only the uncertainty of estimates made concerning the benzene concentrations to which workers were exposed in the occupational studies of Infante, Aksoy, and Ott, that were the basis for developing the benzene unit risk factor (discussed in Appendix D of "Benzene Emissions from Benzene Storage Tanks—Background Information for Proposed Standards", EPA-450/3-80-034a), and are based on a 95 percent confidence interval that assumes the estimated concentrations are within a factor of two.

However, there are several other uncertainties associated with the estimated number of leukemia deaths that are not quantified in these ranges. The number of deaths were calculated based on an extrapolation of the leukemia risk associated with a presumably healthy white male cohort of workers to the general population, which includes men, women, children, non-whites, the aged, and the unhealthy. Uncertainty also occurs in estimating the benzene levels to which people are exposed in the vicinity of petroleum refineries, chemical plants, and bulk storage terminals. Furthermore, leukemia is the only health effect of benzene considered. Additionally, the benefits to the general population of controlling other hydrocarbon emissions from other emission sources in these plants are not quantified. Finally, these estimates do not include the cumulative or synergistic effects of concurrent exposure to benzene and other substances. As a result of these uncertainties, the number of deaths and the maximum lifetime risk due to the emissions from benzene storage vessels could be overestimated. However, and more importantly, they could just as likely be underestimated for the same reasons.

Based on the magnitude of benzene exposures associated with emissions from this source category, on the resulting estimated maximum individual risks and estimated incidence of fatal cancers in the exposed population for the life of existing sources in the category, on the projected increase in benzene emissions as a result of new sources, and on consideration of the uncertainties associated with these quantitative risk estimated (including the effects of concurrent exposures to other substances and to other benzene emissions), the Administrator finds that benzene emissions from benzene storage vessels create a significant risk of cancer and require the establishment of a national emission standard under Section 112.

The Administrator considered the alternative of taking no action to regulate benzene emissions from benzene storage vessels, and relying instead on the OSHA standard for controlling benzene emissions and standards for controlling volatile organic (VOC) emissions in the State Implementation Plans (SIPs). The current OSHA standard stipulates a level of benzene which cannot be exceeded in the work place. However, this work place standard is not expected to result in control of benzene emissions from benzene storage vessels. Consequently, the Administrator rejected reliance on the OSHA benzene standard for control of benzene emissions from benzene storage vessels.

The proposed standard would affect only those vessels storing benzene with a specific gravity within the range of specific gravities specified for Industrial Grade benzene in ASTM-D-836-77, but would affect most benzene storage vessels. Benzene storage vessels are located primarily at petroleum refineries (where 90 percent of benzene is produced), chemical plants, and bulk storage terminals. Most of the benzene produced is ultimately used as a feedstock in the production of chemical intermediates. Production of these intermediates requires essentially pure benzene (i.e., benzene with specifications equal to or exceeding those for industrial grade benzene) in order to maximize product yield. Thus, because most of the benzene stored at refineries, chemical plants, and bulk storage terminals is destined for chemical intermediate production, which requires essentially pure benzene, limiting the coverage of the standard to pure benzene means that the vast majority of benzene storage vessels will be affected.

Benzene is stored in storage vessels with a very wide range of sizes including some very small vessels at facilities such as research laboratories. The control technology required by the proposed standard is not applicable to vessels of this small size. In addition, the amount of benzene emissions from this type of facility is negligible. As a result, it was determined that a lower cutoff limit should be established for this standard. Survey data indicate that 4 cubic meters is the smallest storage vessel used at petroleum refineries, chemical plants, and bulk storage terminals. The equipment required by the standard can be used to control emissions from storage vessels of this size. In addition, setting a cutoff limit at this level would exempt the very small storage vessels at facilities such as research laboratories. For these reasons, the Administrator selected 4 cubic meters as the lower cutoff limit for this standard.

Selection of Regulatory Alternatives

There are basically three different types of vessels used for storing benzene: fixed-roof storage vessels, external floating-roof storage vessels, and internal-floating roof storage vessels. A fixed-roof storage vessel, which generally consists of a cylindrical steel shell with a permanently-affixed roof, is designed to operate at a slight internal pressure above or below atmospheric pressure. Consequently, the emissions from this type of storage vessel can be appreciable.

An external floating-roof storage vessel, rather than having a permanently-affixed roof, has a roof which floats on the surface of the stored liquid, rising and falling with the liquid level. The liquid surface is contacted by the floating roof except in the small annular space between the roof and the wall of the storage vessel where a perimeter seal is used. As a result, the amount of liquid exposed and evaporated to the atmosphere is reduced.

An internal floating-roof storage vessel, the third type of benzene storage vessel, has both a permanently-affixed roof and a roof which floats on the liquid surface (contact roof) or is supported on pontoons several inches above the liquid surface (noncontact roof) inside the storage vessel. A noncontact internal floating roof confines a layer of saturated vapor to a small space above the liquid surface. A contact internal floating roof further reduces evaporation by eliminating the vapor space.

There are basically three methods available for reducing benzene emissions from benzene storage vessels. The first method is to reduce the evaporation of the stored product by eliminating all or part of the vapor space above the liquid surface. One way this can be accomplished is by using a roof and seal combination which floats directly on the liquid surface, thereby eliminating evaporation by restricting vapor formation. It can also be accomplished, although less effectively, by using a roof and seal combination which is supported by pontoons several inches above the liquid surface. This combination reduces emissions by confining the vapors to a small space above the liquid surface.

The second general method available for reducing benzene emissions from storage vessels is to collect the vapors as they evolve and either recover them (e.g., carbon adsorption) or destroy them (e.g., thermal oxidation). There has been little commercial operating experience using vapor control systems to reduce benzene emissions. However, these systems have been demonstrated with other organic vapors and, based on technology transfer, it is believed these systems can be used to control benzene vapors from benzene storage vessels.

The last method available for reducing emissions from benzene storage vessels involves prohibiting the storage of benzene in storage vessels.

The relative effectiveness of different combinations of floating roofs and seals in reducing benzene emissions from benzene storage vessels was recently evaluated in a study conducted for EPA. This study, which was conducted on a 6-meter (20-foot) diameter storage vessel containing benzene, evaluated the effectiveness of five roof and seal combinations including: (1) an external floating roof with a metallic shoe primary seal; (2) an externalfloating roof with a metallic shoe primary seal and a rim-mounted secondary seal; (3) a noncontact internal floating roof with shingled, vapor-mounted primary and secondary seals: (4) floating contact internal floating roof with a liquid-mounted primary seal; and (5) a contact internal floating roof with a liquid-mounted primary seal and a continuous secondary seal.

The test results from this study support engineering judgment that the emissions from a fixed-roof storage vessel can be reduced by converting it to an internal floating roof storage vessel. They also demonstrate that the emissions from an external floating-roof storage vessel can be reduced by installing a secondary seal over the primary seal. Larger reductions of the emissions can be achieved by converting the external floating-roof storage vessel to an internal floating-roof storage vessel. This would involve the installation of a fixed roof over the floating roof. The tests also indicate that the emissions from an internal floating-roof storage vessel can be reduced by using a contact internal floating roof with a liquid-mounted primary seal rather than a noncontact internal floating roof with shingled, vapor-mounted primary and secondary seals. The installation of a secondary seal on a contact internal floating roof results in even less emissions.

The emissions from each type of storage vessel could be further reduced by using a system to collect and either recover or destroy the vapors. Using such a system to control the emissions from an external floating-roof storage vessel would require that a fixed roof be installed over the floating roof.

The emissions from all three types of storage vessels could be altogether eliminated by prohibiting the storage of benzene in storage vessels.

In order to evaluate the environmental, energy, and economic impacts associated with the implementation of standards for both new and existing benzene storge vessels, regulatory alternatives were developed by applying the emissions control techniques in increasing stringency to each type of storage vessel. These regulatory alternatives were then applied to several different model plants which were developed to represent new and existing benzene producers, consumers, and bulk storage terminals.

The baseline for comparison of the alternatives for existing storage vessels assumes that all fixed-roof storage vessels with capacities greater than 150,000 liters storing volatile petroleum liquids such as benzene have internal floating roofs as recommended by the Control Techniques Guideline (CTG) for fixed-roof storage vessels (*Control of Volatile Organic Emissions from Storage of Petroleum Liquids in Fixed-Roof Tanks*) issued in December 1977 (EPA-450/2-77-036). The CTG does not recommend controlling storage vessels with capacities less than 150,000 liters, which are generally fixed-roof storage vessels; therefore, they are assumed to be uncontrolled. The regulatory alternatives for existing sources are summarized below.

Regulatory Alternative I would require that each fixed-roof storage vessel have either a contact or a noncontact internal floating roof. This alternative would affect only fixed-roof storage vessels.

Regulatory Alternative II, in addition to the equipment required in Regulatory Alternative I, would require that each external floating-roof storage vessel have both primary and secondary seals.

Regulatory Alternative III would require that each storage vessel have a fixed roof and a contact internal floating roof with a liquid-mounted primary seal.

Regulatory Alternative IV would require that each storage vessel have a fixed roof and a contact internal floating roof with a liquid-mounted primary seal and a continuous secondary seal.

Regulatory Alternative V would require the use of vapor control systems. Two types of vapor control systems have been evaluated including carbon adsorption systems (Alternative V(A)) and thermal oxidation systems (Alternative V(B)).

Regulatory Alternative VI, the most stringent alternative, would prohibit the storage of benzene in existing storage vessels.

The baseline for comparison of the alternatives for new storage vessels is the New Source Performance Standard (NSPS) for petroleum liquid storage vessels ("Petroleum Liquid Storage Vessels; Standards of Performance for New Stationary Sources") promulgated on April 4, 1980 (45 FR 23374). This NSPS requires that each storage vessel constructed after May 18, 1978, which has a capacity greater than about 150,000 liters have either (1) an external floating roof with primary and secondary seals, or (2) a fixed roof and an internal floating roof. Storage vessels with capacities less than 150,000 liters, generally fixed-roof storage vessels, are unaffected by the NSPS. The regulatory alternatives for new sources are summarized below. These alternatives are identical to those for existing sources except for Alternative II. Because the baseline for new sources assumes more control than that for existing sources, Alternative II for existing sources is not applicable to new sources. Consequently, Alternative II for new sources is identical to Alternative III for existing sources, Alternative II for new sources is identical to Alternative IV for existing sources, etc.

Regulatory Alternative I would require that each fixed-roof storage vessel have either a contact or a noncontact internal floating roof.

Regulatory Alternative II would require that each storage vessel have a contact internal floating roof with a liquid mounted primary seal.

Regulatory Alternative III would require that each storage vessel have a contact internal floating roof with a liquid-mounted primary seal and a continuous secondary seal.

Regulatory Alternative IV would require the use of vapor control systems such as carbon adsorption (Alternative IV(A)) or thermal oxidation (Alternative IV(B)).

Regulatory Alternative V would prohibit the storage of benzene in new storage vessels.

As for existing storage vessels, the most stringent regulatory alternative for new storage vessels is the alternative which prohibits the storage of benzene in storage vessels. Prohibiting the storage of benzene in storage vessels would mean that benzene production and consumption would have to be coordinated so that all benzene would be used immediately after being produced. Such coordination between production and consumption would be very difficult to achieve in practice, especially where the production and consumption facilities are remote from each other. To avoid this problem it is possible that an owner or operator requiring benzene as a feedstock would use an alternate feedstock. However the reasonableness of a requirement which would result in the use of alternate feedstocks is more appropriately evaluated when developing standards for petroleum refineries and individual chemical processes. As a result, the Administrator did not further consider this alternative in developing a standard for either new or existing benzene storage vessels.

Selection of Basis of Proposed Standard—Existing Sources

The basis of the proposed standard for benzene emissions from benzene storage vessels was selected using a two-step process. First, the Administrator examined the regulatory alternatives and selected the one which represents best available technology (BAT) considering the environmental, energy, and economic impacts. After a regulatory alternative was selected as BAT, the Administrator examined the estimated risks remaining after the application of BAT to determine whether they are unreasonable in view of the health benefits and costs, economic impacts, and other impacts that would result if a more stringent alternative was selected.

Selection of Best Available Technology

The environmental, energy, and economic impacts considered in the selection of BAT for existing benzene storage vessels are summarize below.

Environmental Impacts

The national baseline emissions from existing benzene storage vessels are estimated to be approximately 2,200 Mg/year. Regulatory Alternative I would reduce the national benzene emissions from benzene storage vessels by less than 1 percent. Regulatory Alternative II would reduce the national storage vessel emissions by 9 percent to 2,000 Mg/year. Regulatory Alternative III would reduce the national storage vessel emissions by 61 percent to 850 Mg/year. Regulatory Alternative IV would reduce the national emissions to 510 Mg/year. This is a 77 percent reduction of the national baseline emissions from benzene storage vessels. Regulatory Alternative V(A) (carbon adsorption) would reduce the national baseline emissions by 81 percent to 420 Mg/year. Alternative V(B) (thermal oxidation) would reduce the national baseline emissions by 85 percent to 320 Mg/year.

Alternatives I through V would all have potential adverse environmental impacts associated with them. Two adverse environmental impacts associated with all of these regulatory alternatives would be benzene emissions and benzene-contaminated water resulting from the emptying and degassing of storage vessels being inspected or being retrofitted with the required control equipment. These releases would have short-term impacts, however, and the emissions resulting from these operations would be more than offset over time by the emissions reduction associated with the use of the control equipment.

Other adverse environmental impacts would result from use of a thermal oxidation system (Alternative V(B)). These impacts are associated with the use of natural gas or fuel oil to fire a thermal oxidation unit. A thermal oxidation unit which uses either of these as supplemental fuel will produce oxides of nitrogen (NO_x). Oxides of sulfur (SO_x) would also be produced with the use of fuel oil. The emissions from a typical thermal oxidation unit could be as large as 15,000 kilograms per year (kg/year) of (SO_x) and 6,000 kg/year of NO_x.

There could also be some impacts on water quality associated with the use of carbon adsorption or thermal oxidation vapor control systems. One source of benzene-contaminated wastewater common to both types of vapor control systems is a water seal, which is used to assure that flashbacks do not propagate from the vapor control unit to the rest of the piping system. The quantity of water used in two water seals, which would be necessary to ensure safe operation of either system, would average approximately 5,700 liters per day. This would normally be sent to the plant wastewater system for treatment and disposal.

Carbon adsorption vapor control systems can have an additional source of water pollution. In a steam-regenerated carbon adsorption system, steam circulating through the carbon bed heats the carbon and raises the vapor pressure of the recovered benzene. The benzene evolved in this process is removed along with the steam, and the steam-benzene mixture is condensed and decanted. The benzene is returned to storage while benzene-contaminated water (as much as 2,000 liters per day) is sent to the plant wastewater system for treatment and disposal.

Only Alternative V(A), which involves the use of a carbon adsorption vapor control system, will likely result in any solid waste disposal impacts. The only potential impact is associated with the handling of spent carbon from the adsorption unit. Typically, the spent carbon, which is normally replaced approximately once every 10 to 15 years, is transported to a facility for reclamation and reactivation. There would be no solid waste impact associated with this operation. However, this material could be disposed of in a landfill which would result in a solid waste disposal impact. Because the owner or operator of a carbon adsorption unit will most likely choose to have the carbon reclaimed and reactivated, no impact on solid waste disposal in expected with the use of a carbon adsorption system.

Energy Impacts

There would be a slight energy benefit associated with Alternatives I through IV because the control of benzene emissions from benzene storage vessels would offset the need for companies to increase their production levels of benzene.

There would also be a slight energy benefit associated with these alternatives in terms of the benzene emissions saved. Alternatives I and II would save benzene emissions equivalent in energy to about 120 barrels and 1,400 barrels of crude oil, respectively. Alternatives III and IV would save benzene emissions equivalent in energy to about 9,200 barrels and 12,000 barrels of crude oil, respectively.

The only regulatory alternative which would involve the use of energy is the alternative which requires that each storage vessel be fitted to a vapor control system, such as a cabron adsorption system (Alternative V(A)) or a thermal oxidation system (Alternative V(B)). The use of a carbon adsorption system would require electricity to power blowers for collecting and transferring the air-benzene vapor mixture from each storage vessel to the carbon adsorption unit. Low pressure steam would be required to regenerate the carbon bed. Assuming that each facility with benzene storage vessels uses a steam-regenerated carbon adsorption system, the total national energy consumption associated with this alternative would be approximately 0.5 petajoules per year (PJ/yr). This is equivalent in energy to about 83,000 barrels of crude oil.

If the benzene emissions saved (12,000 equivalent barrels of crude oil) are taken into account, the national energy consumption would be equivalent to approximately 71,000 barrels of crude oil.

Use of a thermal oxidation system to reduce benzene vapors would also require electricity to power blowers for collecting and transferring the air-benzene vapor mixture. Supplemental fuel (e.g., natural gas) would also be required to ignite and sustain the combustion process. The total national energy consumption associated with this alternative would be approximately 0.6 PJ/yr (100,000 equivalent barrels of crude oil), assuming each facility uses a thermal oxidation system. Because no benzene is recovered or saved in the thermal oxidation process, there is no crude oil savings to offset the energy required to operate this type of vapor control system.

Economic Impacts

The economic impacts associated with each of the regulatory alternatives have been estimated using first-quarter 1979 dollars. The total national capital and net annualized costs, including solvent credit, for Alternative I are $240,000 and $70,000, respectively. The increase in the price of benzene associated with this alternative would be less than 0.02 percent.

The total national capital and net annualized costs of Alternative II would be approximately $540,000 and $42,000, respectively, and the price increase of benzene would be less than 0.02 percent.

The total national capital and net annualized costs of Alternative III would be approximately $7.3 million and $970,000, respectively, and the largest price increase of benzene would be approximately 0.06 percent.

Regulatory Alternative IV would require a total national capital cost of $11 million and a total net annualized cost of $1.6 million. The largest expected price increase of benzene associated with this alternative would be approximately 0.1. percent.

Regulatory Alternative V(A) (carbon adsorption) would require a total national capital cost of $35 million and a total net annualized cost of $10 million. The largest expected price increase of benzene would be approximately 0.8 percent. Regulatory Alternative V(B) (thermal oxidation) would require a total national capital cost of $29 million and a total net annualized cost of $9.3 million. These costs would result in a benzene price increase of approximately 0.7 percent.

In selecting best available technology (BAT) for existing sources, the Administrator examined the regulatory alternatives to determine the most advanced level of control adequately demonstrated considering the economic, energy, and environmental impacts and the technological problems associated with retrofit. The Administrator first considered the most stringent regulatory alternative, Alternative V, which would require that each storage vessel be fitted to a vapor control system. Because Alternative V(B) would provide more emissions reduction than Alternative V(A) with less economic impact, the Administrator considered Alternative V(B) rather than V(A) in selecting BAT. This is the most advanced level of control which could be required short of prohibiting the storage of benzene, and would reduce the national benzene emissions from existing storage vessels from 2,200 Mg/yr to 320 Mg/yr.

This alternative would result in a capital cost of $29 million, an annualized cost of $9.3 million, and a price increase of 0.7 percent. In addition, this alternative is the only alternative considered which has any potential continuous adverse energy and environmental impacts. Because of the magnitude of the capital and annualized costs associated with this alternative and the fact that the use of vapor control systems would result in the use of energy and would impact other environmental media, the Administrator examined Regulatory Alternative IV before selecting BAT.

Regulatory Alternative IV would require that each storage vessel have a contact internal floating roof, a liquid-mounted primary seal, and a continuous secondary seal. This alternative represents the next less stringent level of control to that of Regulatory Alternative V, and would reduce the national benzene emissions to 510 Mg/yr. The various components of the equipment required by this alternative are in widespread commercial use, being used in many storage vessels. The national capital cost for Alternative IV would be about $11 million, the annualized cost would be about $1.6 million, and the price increase would be about 0.1 percent. Alternative IV would result in a small but positive energy impact and would have no potential continuous adverse environmental impacts.

The Administrator considered Alternatives V and IV and their economic impacts before selecting BAT. Regulatory Alternative V(B) would reduce the benzene emissions by an additional 8 percent in comparison to Regulatory Alternative IV. However, in contrast to this impact, Regulatory Alternative V(B) would result in much greater costs, economic, energy, and environmental impacts. For example, the capital cost of Alternative V(B) is three times higher and the annualized cost is six times higher for Alternative V(B) than for Alternative IV. Also, the percent price increase is as much as seven times higher. Thus, because the additional emissions reduction associated with Regulatory Alternative V(B) is small in comparison to that for Regulatory Alternative IV and the economic, energy, and secondary environmental impacts associated with Regulatory Alternative V(B) are grossly disproportionate to the emissions reduction in comparison to those for Regulatory Alternative IV, the Administrator selected Regulatory Alternative IV as BAT. Alternative IV would result in a significant emissions reduction at a reasonable cost, a small positive energy impact, and no potential continuous adverse environmental impacts. In addition, the small increase in emissions reduction and the sharp decreases in economic and cost impacts observed when comparing Alternative V(B) with Alternative IV, does not exist when comparing Alternative IV with the next less stringent alternative.

Consideration of Unreasonable Risk and Selection of the Level of the Standard

After the application of BAT (Alternative IV) to existing benzene storage vessels, it is estimated that there would be 0.03 to 0.20 deaths per year due to benzene emissions from these storage vessels. Assuming that a typical facility has an operating life of 20 years as discussed in "Rationale for Regulating Benzene Storage Vessels", the estimated number of deaths which would occur over a 20-year operating life of the 143 existing facilities would range from 0.60 to 4.0. The maximum lifetime risk to the most exposed population after the application of BAT would range from 2.7×10^{-5} to $1.9 \times 10-4$. These numbers include benzene emissions from benzene storage vessels only and not other possible sources of emissions where these storage vessels are located. Alternative V, the next more stringent alternative than BAT, would require the use of vapor control systems. If thermal oxidation systems were used, the estimated residual incidence would range from 0.02 to 0.11 deaths per year. Assuming that a typical facility has a 20-year operating life, the estimated number of deaths which would occur over a 20-year operating life of the 143 existing facilities would range from 0.40 to 2.2. The maximum lifetime risk after the application of BAT wouldf range from 4.1×10^{-5} to $2.9 \times 10-4$. However, requiring the use of vapor control systems would increase the total capital cost from $11 million to $29 million and the total annualized cost from $1.6 million to $9.3 million. It could also result in adverse impacts on air quality, water quality, and energy consumption. In view of the relatively small health benefits that would be gained with the additional costs and the potential adverse environmental impacts associated with the use of vapor control systems, the Administrator determined that the risks remaining after applying BAT to existing storage vessels are not unreasonable. The Administrator determined, therefore, that the standard for existing benzene storage vessels should be based on BAT (Alternative IV).

[a] The maximum lifetime risk associated with Alternative V is greater than that associated with Alternative IV because in Alternative V the benzene emissions from all storage vessels at a plant are discharged from a single stack, whereas in Alternative IV, the emissions are discharged from individual storage vessels and are, therefore, more dispersed.

Selection of Basis of Proposed Standard—New Sources

Selection of Best Available Technology

The environmental, energy, and economic impacts considered in the selection of BAT for new benzene storage vessels are summarized below. An estimated 168 new benzene storage vessels will be constructed through 1983. The number of new storage vessels was estimated by multiplying the number of new plants expected to be built through 1985 by the number of storage vessels in each model plant. Because new plants are expected to be the same size as existing plants, the number of storage vessels in each new model plant is the same as the number in each existing model plant. However, because there are fewer new plants than existing plants, the national impacts differ.

Environmental Impacts

The national baseline emissions from new benzene storage vessels are estimated to be approximately 930 Mg/year in 1985. Regulatory Alternative I would reduce the 1985 national baseline emissions from new storage vessels by about 1 percent to 920 Mg/year. Total national emissions in 1985 would be reduced by Regulatory Alternative II to approximately 290 Mg/year. This is a 69 percent reduction of the national baseline emissions from new sources in 1985. National emissions from new storage vessels in 1985 would be reduced to 170 Mg/year by Alternative III. This is an 82 percent reduction of the 1985 national baseline emissions. Regulatory Alternative IV(A) (carbon adsorption) would reduce the national baseline emissions by 85 percent to 140 Mg/year. Alternative V(B) (thermal oxidation) would reduce the national baseline emissions by 88 percent to 110 Mg/year.

The potential adverse environmental impacts associated with the various alternatives for new sources are similar to those discussed in "Selection of Basis of Proposed Standard-Existing Sources," and are not repeated here.

Energy Impacts

There would be a slight energy benefit associated with Alternatives I through III because the control of benzene emissions from benzene storage vessels would offset the need for increasing tthe production levels of benzene.

There would also be a slight energy benefit associated with these alternatives in terms of the benzene emissions saved. Alternative I would save benzene emissions equivalent in energy to about 68 barrels of crude oil. Alternatives II and III would save benzene emissions equivalent in energy to about 4,400 barrels of crude oil.

The only regulatory alternatives having any energy impacts are those which require that each storage vessel be fitted to a carbon adsorption or thermal oxidation vapor control system (Regulatory Alternatives IV(A) and IV(B), respectively). The bases of these impacts are discussed in "Selection of Basis of Proposed Standard-Existing Sources" and are not repeated here. However, because the number of new plants affected by the proposed standard is different than the number of existing plants, the national energy impacts differ. The total national energy consumption in 1985 for either of these alternatives would be approximately 0.2 petajoules per year (PJ/yr). This is equivalent in energy to about 33,000 barrels of crude oil. The national energy consumption associated with Alternative IV(A) would be equivalent to approximately 28,000 barrels of crude oil after taking into account the benzene emissions saved (5,400 equivalent barrels of crude oil). The national energy consumption associated with Alternative IV(B) would be equivalent to approximately 33,000 barrels of crude oil, because there are no savings resulting from the use of a thermal oxidation system.

Economic Impacts

The economic impacts associated with each of the regulatory alternatives have been estimated using first-quarter 1979 dollars. The total national capital and net annualized costs, including solvent credit, associated with Regulatory Alternative I would be approximately $73,000 and $20,000, respectively. The increase in the price of benzene due to this alternative would be less than 0.02 percent.

In order to comply with Regulatory Alternative II, the industry would incur total capital and net annualized costs of approximately $1.7 million and $99,000, respectively. This would result in a price increase of benzene of approximately 0.05 percent.

Regulatory Alternative III would result in total national capital and net annualized costs of $2.7 million and $260,000, respectively. This alternative would result in a price increase of benzene of less than 0.1 percent.

Regulatory Alternative IV(A) (carbon adsorption) would require a total national capital cost of $12 million and a net annualized cost of $3.3 million. The largest expected price increase of benzene associated with this alternative would be approximately 0.8 percent. Regulatory Alternative IV(B) (thermal oxidation) would require a total national capital cost of $9.5 million and a net annualized cost of $3.1 million. The resulting benzene price increase would be approximately 0.7 percent.

In selecting best available technology (BAT) for new sources, the Administrator examined the regulatory alternatives to determine the most advanced level of control adequately demonstrated, considering the economic, energy, and environmental impacts. The Administrator first considered the most stringent regulatory alternative, Alternative IV, which would require that each storage vessel be fitted to a vapor control system. Because Alternative IV(B) would provide more emissions reduction than Alternative IV(A) with less economic impact, the Administrator considered Alternative IV(B) rather than Alternative IV(A) in selecting BAT. This would be the most advanced level of control which could be required without prohibiting the construction of new benzene storage vessels, and would reduce the national benzene emissions from new storage vessels in 1985 from 930 Mg/yr to 110 Mg/yr.

This alternative would result in a capital cost of $9.5 million, an annualized cost of $3.1 million, and a price increase of 0.7 percent. In addition Alternative IV(B) is the only alternative considered which has any potential continuous adverse energy and environmental impacts. Because of the magnitude of the capital and annualized costs for Alternative IV(B) and the fact that the use of vapor control systems would result in the use of energy and would impact other environmental media, the Administrator examined Regulatory Alternative III before selecting BAT.

Regulatory Alternative III would require that each storage vessel have a contact internal floating roof, a liquid-mounted primary seal, and a continuous secondary seal. This alternative represents the next less advanced level of control to that of Regulatory Alternative IV and would reduce the national benzene emissions in 1985 to 170 Mg/yr. The various components of the equipment required by this alternative are in widespread commercial use, being used in many storage vessels. The capital cost for Alternative III would be about $2.7 million, the annualized cost would be about $260,000, and the price increase would be about 0.1 percent. Alternative III would result in a small but positive energy impact and would have no potential continuous adverse environmental impacts.

The Administrator considered Alternatives IV and III and their economic impacts before selecting BAT. Regulatory Alternative IV(B) would result in an additional 6 percent emission reduction compared with Regulatory Alternative III. However, in contrast to these impacts, Regulatory Alternative IV(B) would result in much greater economic, energy, and environmental impacts. For example, the capital cost of Alternative IV(B) is four times higher and the annualized cost is 12 times higher for Alternative IV(B) than for Alternative III. Also, the percent price increase of benzene is 7 times higher. Thus, because the additional emissions reduction associated with Regulatory Alternative IV(B) is small in comparison to that for Regulatory Alternative III and the economic, energy, and secondary environmental impacts associated with Regulatory Alternative IV(B) are grossly disproportionate to the emissions reduction in comparison to those for Regulatory Alternative III, the Administrator selected Regulatory Alternative III as BAT. Alternative III would result in a significant emissions reduction at a reasonable cost, a small positive energy impact, and no potential continuous adverse environmental impacts. In addition, the small increase in emissions reduction and the sharp decrease in economic and cost impacts observed when comparing Alternative IV(B) with Alternative III, do not exist when comparing Alternative III with the next less stringent alternative.

Consideration of Unreasonable Risk and Selection of the Level of the Standard

The proposed "Policy and Procedures for Identifying, Assessing, and Regulating Airborne Substances Posing a Risk of Cancer" (44 FR 58642) includes certain requirements for the siting of new sources. These are not implemented in the proposed standard because the details of the procedures have not been formulated. New source siting requirements for storage vessels may be proposed in the future, but would only apply to new sources constructed, modified, or reconstructed after the proposal date of such siting requirements.

For new sources constructed, modified, or reconstructed in the interim, the Administrator is making a judgment on whether the estimated risks remaining after the application of BAT selected for new sources are not unreasonable in view of the health benefits and costs, economic impacts, and other impacts that would result if a more stringent alternative were selected. In making this judgment, the approach of estimating the residual risks was based on estimates of benzene emissions from new storage vessels and on the assumption that population distributions around new storage vessels would be similar to those around existing storage vessels. The Administrator decided to use this approach because it seems the most reasonable approach in the absence of new source siting requirements.

No information is available on the future location of new storage vessels or the number of people which will be exposed to the emissions from them. They could be located at existing plant sites or entirely new sites. There is no available information to indicate that population distributions around new storage vessels will be greater or less than they are for existing storage vessels. Therefore, for purposes of estimating deaths due to emissions from new storage vessels, it was assumed that the population distributions would be the same as they are for existing storage vessels. Therefore, residual deaths were calculated for new storage vessels by using the growth projections for new storage vessel capacity and assuming the population distributions were the same for new storage vessels as for existing storage vessels. Even if the new storage vessels were added at existing plant sites, this would be an accurate assumption because the people living in the vicinity of these plants would be exposed to additional emissions and because a linear dose-response model was used to calculate deaths.

In calculating the residual maximum lifetime risk after the application of BAT to new storage vessels, it is reasonable to assume that exposures around new plant sites would be no greater than they are around existing plant sites. They could be greater if new storage vessels were added to the existing plant site associated with the maximum lifetime risk for existing sources. However, because there is no information indicating that this will occur, it was assumed that the maximum lifetime risk associated with new storage vessels would be no greater than that for existing storage vessels.

Using the assumptions discussed above, it is estimated that 0.01 to 0.07 deaths per year would occur in 1985 due to benzene emissions from new storage vessels after the application of BAT. Maximum lifetime risk to the most exposed population after the application of BAT would range from 2.7×10^{-5} to 1.9×10^{-4}. These numbers include benzene emissions from storage vessels only and not other possible sources of emissions where benzene storage vessels are located. Alternative IV, the next more stringent alternative than BAT, would require the use of vapor control systems. If thermal oxidation systems were used, the estimated residual incidence would range from 0.01 to 0.04 deaths per year and the maximum lifetime risk would range from 4.1×10^{-5} to 2.9×10^{-4}.[8] However, requiring the use of vapor control systems would increase the total capital costs from $2.7 million to $9.5 million and the total annualized costs from $0.02 million to $3 million. It could also result in potential adverse impacts on air quality, water quality, and energy consumption. In view of the relatively small health benefits that would be gained with the additional costs and the potential adverse environmental impacts associated with the use of vapor control systems, the Administrator determined that the risks remaining after the application of BAT to new storage vessels are not unreasonable. Consequently, the Administrator determined that the standard for new benzene storage vessels should be based on BAT.

Selection of Format for the Proposed Standard

In Section 112 of the Clean Air Act, the Administrator is required to prescribe an emission standard whenever it is feasible. Section 112(e) states that "if in the judgment of the Administrator, it is not feasible to prescribe or enforce an emission standard for control of a hazardous air pollutant or pollutants, he may instead promulgate a design, equipment, work practice, or operational standard, or combination thereof." The term "not feasible" is applicable if the emissions cannot be captured and vented through a vent or stack designed for that purpose or if the application of a measurement methodology is not practicable due to technological or economic limitations.

Establishing an emission standard for storage vessels would require the measurement of emissions from each storage vessel; therefore, the emissions would have to be vented in a manner that would allow the measurement of pollutant concentrations and flow rates. Storage vessels equipped with the control equipment upon which the proposed standard is based do not typically have a conveyance designed to capture the emissions or a stack or vent through which the emissions pass to the atmosphere. Equipping each storage vessel with a capture and stack system would be possible, but would be economically impracticable, especially considering that the sole purpose of the system would be for emissions testing. Another consideration is that the emissions from storage vessels are intermittent and are often at flow rates too low to measure, thereby making emissions measurement technically impracticable. For these reasons, the Administrator has concluded that establishing an emission standard is not feasible for benzene storage vessels.

The possibility of establishing a "design, equipment, work practice, or operational standard, or combination thereof" was then examined. The regulatory alternative upon which the proposed standard is based consists of certain equipment and design specifications. Operational requirements, which consist of inspection and repair requirements, are necessary to insure the continued integrity of the control equipment. Therefore, the Administrator concluded that the format of the standard should include a combination of design, equipment, work practice, and operational standards.

Modification and Reconstruction Considerations

An existing source is one which is constructed, modified, or reconstructed before the proposal date of a standard and a new source is one which is constructed, modified, or reconstructed after the proposal date of a standard. A modification occurs when there is a physical or operational change to a source accompanied by an increase in benzene emissions to the atmosphere. Several exclusions from the modification definition are listed in § 61.01(j) of the General Provisions for hazardous air pollutant standards. Reconstruction occurs when the components of an existing source are replaced to the extent that the fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable new facility.

Even though the proposed standards for existing and new storage vessels are identical, the Clean Air Act designates different compliance periods for new and existing sources. Existing sources must comply within 90 days of the effective date, but may obtain a waiver of compliance for up to 2 years from the effective date. New sources (including modified and reconstructed sources) must comply with the standard at

[8] The maximum lifetime risk associated with Alternative IV is greater than that associated with Alternative III because in Alternative IV the benzene emissions from all storage vessels at a plant are discharged from a single stack, whereas in Alternative III the emissions are discharged from individual storage vessels and are, therefore, more dispersed.

startup, unless startup occurs before the effective date, in which case they must comply by the effective date.

Storage vessels can be used to store different materials at different times. If an existing storage vessel was being used to store a liquid other than benzene before the proposal date of the standard and is filled with benzene after the proposal date, the storage vessel would be considered modified and would, therefore, have to comply with the standard just as if it was a new source. An operational change and an increase in benzene emissions would have occurred. If this change in material stored occurred between proposal and promulgation of the standard, the storage vessel would have to be in compliance on the promulgation date of the standard. If this change in material stored occurred after promulgation of the standard, the storage vessel would have to be in compliance with the standard upon filling the vessel with benzene. This is considered reasonable because after proposal of this standard, the owner or operator has been put on notice that he would be subject to the standard prior to filling the vessel with benzene.

Because the proposed standard for existing storage vessels is identical to that for new storage vessels, and existing storage vessel which is reconstructed would have to comply with the same requirements with which it would have to comply had it not been reconstructed. However, the compliance times would be different. Therefore, the proposed standard states that the owner or operator of a source does not have to apply for approval of reconstruction under Section 61.07 of the General Provisions if the source is in compliance with the standard. Because a modification, by definition, involves an emissions increase, a storage vessel is not exempt from Section 61.07 of the General Provisions even if it does comply with the requirements of the standard.

According to the definition of reconstruction which is contained in the proposed standard, there are two criteria which the Administrator will consider in deciding whether a source is reconstructed. The first is whether "the fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable, entirely new source." The second is whether "it is feasible, considering economic impacts and the technological problems associated with retrofit, to meet the applicable standard for new sources set forth in this subpart." The second criterion is meaningless after the waiver period with regard to the proposed standard because the standards for new and existing sources are identical. That is, the economic impacts and the technological problems associated with retrofitting existing storage vessels have already been considered, and it has already been decided that existing sources can meet the proposed standard for new sources.

Despite these considerations, both parts of the definition of reconstruction have been retained in the proposed standard because amendments to the General Provisions for Part 61 are currently being developed and will contain this definition. This definition will apply to the subpart for benzene storage vessels as well as other subparts. Except during the waiver period, the second criterion in the definition will be applicable only if in the future the standard for new and existing storage vessels is different. The full definition of reconstruction is included in the proposed standard for comment because it is possible that sometime in the future the standard could be different for new and existing benzene storage vessels.

Selection of Equipment Specifications

The equipment specified as best available technology (BAT) for controlling benzene emissions from new and existing benzene storage vessels was selected largely on the basis of emissions tests conducted for EPA on a 6-meter (20-foot) diameter storage vessel containing benzene. This equipment includes a contact internal floating roof, a liquid-mounted primary seal, and a continuous secondary seal.

The standard would allow the owner or operator of a storage vessel to use other equipment or procedures to reduce benzene emissions from the storage vessel if the equipment or procedure is demonstrated to be equivalent in reducing emissions to that equipment required by the standard. Equivalence could be demonstrated by one of several methods including (1) an actual emissions test which uses a full-size or scale-model sealed storage vessel which accurately collects and measures all benzene emissions from the storage vessel, or (2) an engineering evaluation approved by the Administrator.

Based on information presented in American Petroleum Institute (API) Publication 2517 and on engineering judgment, a metallic shoe seal would be considered an equivalent control device to the liquid-mounted primary seal required by the proposed standard; consequently, a metallic shoe seal would be allowed by the proposed standard. In addition, a vapor control system which is designed to reduce the benzene emissions discharged from a storage vessel at an efficiency of at least 95 percent (by weight) and which is operated at the design specifications to achieve this emissions reduction would be considered an equivalent control system if it is approved by the Administrator, and would be allowed by the proposed standard. This control level has been selected because it provides an approximately equal emissions reduction to the equipment specified by the proposed standard, relative to the emissions from a fixed-roof storage vessel. The efficiency of the vapor control system would be calculated by comparing the controlled emissions to those emissions which would occur from a fixed-roof storage vessel without a vapor control system.

Selection of Initial Inspection and Reporting Requirements

Because direct measurement of the emissions from storage vessels is impracticable, the proposed standard would not require an initial test to determine the emissions from each affected storage vessel. Instead, the standard would require that the owner or operator of each storage vessel submit a report to the Administrator describing the control equipment being used to reduce benzene emissions.

The owner or operator would also be required to inspect and report the condition of the control equipment before filling the storage vessel with benzene. During this inspection the owner or operator would inspect for defects in the internal floating roof and for holes, tears, or other openings in the primary seal, secondary seal, and seal fabric. All defects in the floating roof and seals would have to be repaired before the storage vessel could be filled with benzene. Finally, the standard would require the owner or operator to notify the Administrator at least 30 days in advance of filling the storage vessel with benzene so that the Administrator could have the opportunity to have an observer inspect the control equipment before the storage vessel is filled. This requirement is necessary because it will be infeasible to inspect all the control equipment once the storage vessel is filled.

Control Equipment Failures and Selection of Periodic Inspection and Repair Requirements

As is the case with any control equipment, internal floating roofs and seals can fail, resulting in an increase in emissions from the respective storage vessels. One failure which can occur is the sinking of the internal floating roof. Steel pan internal floating roofs, which rely on liquid displacement for flotation, are especially susceptible to sinking whenever liquid accumulates on the roof surface. Liquid can accumulate on steel pans for several reasons including (1) leaks or holes in the roof; (2) splashing of liquid onto the roof from the improper use of mixers at low liquid levels; (3) tipping of the roof on roof support columns as the roof rises and falls; and (4) tipping of the roof by large vapor bubbles expanding under one section of the roof. Liquid generally accumulates in one location on a steel pan causing an edge to become submerged, which eventually result in the sinking of the roof.

Other types of internal floating roofs may be less susceptible to sinking when liquid accumulates on them. These roofs include: (1) aluminum sandwich panel roofs with a honeycombed aluminum core floating in contact with the liquid, and (2) pan-type steel roofs supported on the liquid by pontoons. Aluminum sandwich panel roofs, because of their rigidity, are susceptible to failure at joints in the roof. This problem is compounded by their light weight, which promotes hangup or jamming as the roof rises and falls inside the storage vessel. Pan-type steel roofs supported by pontoons can sink if several pontoons are punctured. No failure incidence has been recorded for either of these types of roofs. However, their inherent stability dictates that their failure rates should be very low.

Seals, while not subject to abrupt failures like roofs, do deteriorate over time. For example, holes, tears, and other openings can develop in the primary and secondary seals as the seals abrade against the wall of the storage vessel. These openings, which indicate that the seal is in need of repair or replacement, may expose benzene to evaporation, reducing the effectiveness of the seal. If openings develop in a foam-filled primary seal, the foam will absorb the benzene, causing the seal to sag. This reduces the ability of this type of seal to prevent emissions from the rim space. If the primary seal is liquid-filled, openings will allow the liquid to escape, reducing the seal's effectiveness.

Gaps which develop between either the primary seal or the secondary seal and the shell of the storage vessel will also reduce the seal's ability to reduce emissions. Gaps can develop as a result of shell deformations or the inability of a seal to conform to varying gaps because of a loss of seal flexibility.

Emissions tests recently conducted for EPA have indicated that "* * * the condition (tight or gapped) of the primary seal is not as significant if a tight secondary seal is present." Based on data acquired by an air regulatory agency during seal gap inspections on 17 external floating-roof storage vessels and engineering judgment, at least 76 percent of internal floating-roof storage vessels can be expected to have no measurable gap between the secondary seal and the shell of the storage vessel. Of the remaining storage vessels, 18 percent would have tight secondary seals with total gap areas of less than 21.2 cm^2/m (1 in^2/ft) of vessel diameter and 6 percent would have severely gapped secondary seals with gap areas in excess of 212 cm^2/m (10 in^2/ft) of vessel diameter. Severely gapped secondary seals would not be very effective at reducing emissions.

Section 112(e) of the Clean Air Act states that if the Administrator prescribes an equipment standard for control of a hazardous air pollutant such as benzene, he shall "include as part of such standard such requirements as will assure the proper operation and maintenance of any element of * * * equipment." Ideally, it would be preferable to include operation and maintenance procedures in the standard which would prevent control equipment failures. However, no such procedures are available to prevent the type of failures which occur while using the control equipment specified by the proposed standard.

Because control equipment failures cannot be prevented, the next best operation and maintenance procedure is to require that the owner or operator of each storage vessel inspect the integrity of the control equipment and repair any failures. The procedure generally specified in regulations for external floating-roof storage vessels for determining the integrity of primary and secondary seals is to periodically inspect the gaps between the seals and the wall of each storage vessel while the storage vessel is in operation. However, it is not reasonable to require that inspections be conducted in internal floating-roof storage vessels containing benzene because of the benzene health hazard to which inspoectors could be exposed while inside these vessels. In addition, because seal gap data are unavailable to correlate the gaps when a roof is floating with the gas when the roof is on its leg supports, gap criteria cannot be specified for an empty storage vessel. As a result, no quantitative gap measurement criteria can be specified for internal floating-roof storage vessels used for storing benzene.

In lieu of such gap criteria, the owner or operator of each storage vessel could be required to periodically inspect the condition of the floating roof and the secondary seal from the manhole and roof hatches on the fixed roof of each storage vessel. The primary seal would not be visible during such an inspection, however, and could only be inspected from inside the storage vessel, after it had been emptied and degassed. The degassing of a storage vessel, however, produces emissions. For a medium-size storage vessel, these emissions amount to approximately 0.3 Mg each time the vessel is degassed. These emissions could conceivably be controlled through the use of a vapor control system; however, it is both technically and economically impractical to require that a facility maintain such a system to control these intermittent and infrequent emissions. As a result, the Administrator decided not to require the control of degassing emissions.

The next question regarding the inspection of primary seals concerns the frequency of such inspections. These seals have a very low failure rate and, when installed properly, are expected to last many years. In addition, emissions tests conducted for EPA have indicated that the condition of the primary seal has a minimal effect on the emissions when there is a secondary seal above the primary seal. As a result, the emissions associated with frequent degassing may actually exceed those that would be produced by not inspecting the primary seal on a frequent basis.

After considering the expected low incidence of control equipment failures, the degassing emissions that would occur in order to inspect for these failures, and the fact that the secondary seal could be expected to reduce emissions from a primary seal failure, the Administrator decided to require that complete internal inspections of the control equipment be conducted only once every 5 years.

The owner or operator of a benzene storage vessel may find it necessary on an infrequent occasion to empty and degas a storage vessel for reasons other than equipment inspections. In order to further reduce the emissions due to degassing for inspections, the Administrator decided to require an entire inspection from inside the storage vessel any time a storage vessel is degassed for any purpose. The storage vessel would not have to be degassed and inspected again for another 5 years. This would reduce emissions because it would result in only one degassing when two may have occured otherwise, one for a facility need and one for an inspection.

Once a storage vessel has been degassed and inspected, the proposed standard would require that all control equipment failures be repaired before the storage vessel is refilled with benzene. This would not only prevent any further emissions due to control equipment failures, but would also prevent the emissions resulting from a subsequent degassing to repair the failures. Such a requirement is considered reasonable because the inspection and repair program is only required every 5 years and the owner or operator can plan ahead to have the storage vessel out of service long enough to make all necessary repairs.

As discussed previously, at least some failures of the internal floating roof and secondary seal can be detected from roof hatches or manholes in the fixed roof above the internal floating roof. Failures detectable from the fixed roof include defects in or benzene accumulated on the internal floating roof, holes or tears in the secondary seal, and relatively large gaps between the secondary seal and wall of the storage vessel.

The costs of inspecting the internal floating roof and the secondary seal through the roof hatches and manholes would be small (less than 1 person-hour per inspection for the average size storage vessel). However, due to the expected low incidence of equipment failures, requiring very frequent inspections would not be reasonable, even considering the low costs. Therefore, the Administrator decided to require that such inspections be conducted only once every 3 months.

If during a 3-month inspection, the owner or operator finds that there are defects in or benzene accumulated on the floating roof, there are holes or tears in the secondary seal, or there is a visible gap between the secondary seal and the wall of the storage vessel, these failures would have to be repaired. In order to repair these failures, all benzene in the storage vessel would have to be removed and the storage vessel degassed. Once this is done, there would be no additional emissions due to the control equipment failure. For this reason, there is no reason to put a limit on the length of time allowed for repairing control equipment failures. However, it is necessary to place a time constraint on the length of time benzene would be allowed to remain in the storage vessel. The Administrator considered requiring that the benzene be removed immediately after a failure is detected. However, not all facilities could be expected to have extra storage capacity for the displaced benezene. A survey of benzene storage facilities (Docket Number A-80-14, items II-67 through II-70) indicates, however, that most facilities could within 30 days empty a storage vessel having equipment in need of repair. As a result, the Administrator has determined that it is reasonable to require in the proposed standard that the owner or operator of a storage vessel empty the storage vessel within 30 days if a failure is detected during a 3-month inspection. Additionally, the storage vessel could not be refilled with benzene until the failure is corrected.

The emissions and the residual risks used in selecting BAT and the proposed standard for existing and new sources were calculated assuming there would be no emissions due to degassing or control equipment failures. Actually, as discussed in this section, complete prevention of these failures is not possible. Operation and maintenance procedures for minimizing these emissions to the extent possible have been discussed in this section and are required by the proposed standard. In fact, however, the total emissions allowed by the standard include (1) those due to initially degassing existing storage vessels to retrofit them with control equipment, (2) those due to degassing each storage vessel each 5 years for the 5-year inspection, (3) those due to degassing a storage vessel to repair failures detected during the 3-month inspection, (4) those due to unrepaired failures in a primary seal which can be undetected for as long as 5 years, and (5) those due to unrepaired failures in the internal floating roof and secondary seal which can be undetected or unrepaired for as long as 4 months. These emissions allowed by the proposed standard are in addition to those which are released even when the required equipment is in place without defects.

The annual allowable emissions in 1985 resulting from control equipment failures and the degassing of benzene storage vessels meeting the proposed standard is estimated to be about 50 Mg. Little information is available on the expected frequency of such failures. Also, it is difficult to estimate the emissions due to failures such as holes or tears in seals. Furthermore, the emissions rate is dependent on the extent of such a hole or tear. A number of assumptions had to be made in deriving this emission estimate. These assumptions are detailed in Docket Item No. II-B-19.

The residual risks due to all emissions allowed by the proposed standard, including the emissions from equipment failures, were calculated using these emissions estimates. The residual incidence in 1985 with the proposed standard in effect would be increased by 0.003 to 0.020 deaths and the maximum lifetime risk would be increased by 7.6×10^{-6} to 5.3×10^{-5}. These increases are small due to the expected low control equipment failure rate. The only alternatives available for reducing these residual risks are those which would require the use of vapor control systems (Regulatory Alternative V for existing sources and Alternative IV for new sources) and those which prohibit the storage of benzene in storage vessels. The reasons for dismissing the latter alternatives on an across-the-industry basis are discussed in "Selection of Regulatory Alternatives." The costs and risks which would result if vapor control systems were required are discussed in the section entitled "Consideration of Unreasonable Risk and Selection of the Level of the Standard." As was stated there for continuous emissions, in view of the relatively small health benefits that would be gained with the additional costs and the potential adverse environmental impacts associated with the use of vapor control systems, the Administrator determined that the risks remaining after applying BAT for continuous emissions and emissions due to control equipment failures to existing and new storage vessels are not unreasonable.

Impacts of Reporting Requirements

The owner or operator of each storage vessel would be required to submit a report to the Administrator after each inspection conducted in accordance with the requirements of the standard. An initial report would have to be submitted following the first inspection of the storage vessel after the required control equipment has been installed. Periodic reports would also have to be submitted after each 3-month inspection and each 5-year inspection required by the standard. Each of these reports would have to identify each storage vessel which did not meet the requirements of the standard and the reason it did not meet the requirements. In the subsequent quarterly report a description of the steps taken to bring the storage vessel into compliance would have to be included. If the storage vessel has not been emptied or repaired within 30 days after being identified as out of compliance, then an interim report stating this would have to be submitted. If the storage vessel did not contain benzene prior to implementation of the standard, or if the storage vessel had to be emptied and degassed to bring it into compliance with the standard, the owner or operator would have to notify the Administrator at least 30 days prior to filling the storage vessel so the Administrator could have the opportunity to send a representative to inspect the storage vessel prior to its filling. An estimated 10 person-years would be required for the industry to comply with these reporting requirements for all benzene storage facilities through the first 5 years of the regulation.

Public Hearing

A public hearing will be held to discuss the proposed standard for benzene storage vessels in accordance with Sections 112(b)(1)(B) and 307(b)(5) of the Clean Air Act. Persons wishing to make oral presentations regarding the proposed standard for benzene storage vessels should contact EPA at the address given in the ADDRESSES section of this preamble. Oral presentations will be limited to 15 minutes each. Any member of the public may file a written statement before, during, or within 30 days after the hearing. Written statements should be addressed to the Central Docket Section address given in the ADDRESSES section of this preamble and should refer to docket number A-80-14.

A verbatim transcript of the hearing and written statements will be available for public inspection and copying during normal working hours at EPA's Central Docket Section in Washington, D.C. (see ADDRESSES section of this preamble).

Docket

The docket is an organized and complete file of all the information submitted to or otherwise considered by EPA in the development of the proposed standard. The principal purposes of the docket are (1) to allow members of the public and industries involved to identify and locate documents so they can intelligently and effectively participate in the standard setting process, and (2) to serve as the record in case of judicial review.

Miscellaneous

As prescribed in Section 112 of the Clean Air Act, the proposal of this standard has been preceded by the Administrator's determination that benzene is a hazardos air pollutant as defined in Section 112(a)(1) of the Act. Benzene was added to the list of hazardous air pollutants on June 8, 1977.

In accordance with Section 117 of the Act, publication of this proposed standard was preceded by consultation with the appropriate advisory committees, independent experts, and Federal departments and agencies. In addition, members of the benzene task group of the Interagency Regulatory Liaison Group, representing EPA, OSHA, the Food and Drug Administration, and the Consumer Product Safety Commission, have met and reviewed the proposed regulation to ensure that the statement of the rule is jointly understood and is consistent with their programs. The Administrator welcomes comments on all aspects of the proposed standard, including economic and technological issues.

Comments are also specifically invited on the relative effectiveness of contact and noncontact internal floating roofs. Based on engineering judgment, a contact internal floating roof, which eliminates evaporation by restricting vapor formation, is more effective at reducing emissions than a noncontact roof, which reduces emission by confining the vapors to a small space above the liquid surface. Recent emissions tests conducted for EPA have demonstrated that a contact internal floating roof with a liquid-mounted primary seal and a continuous secondary seal is more effective at reducing emissions than a noncontact internal floating roof with shingled, vapor-mounted primary and secondary seals. However, because the roofs tested were equipped with different types of seals, the relative effectiveness of contact and noncontact internal floating roofs cannot be quantified. Any comments submitted to the Administrator on this issue should contain specific information and data pertinent to an evaluation of the issue.

This standard will be reviewed 5 years from the date of promulgation. This review will include an assessment of such factors as the need for integration with other programs, the existence of alternative methods of emission control, enforceability of the standard, improvements in emissions control technology, and reporting requirements. The reporting requirements in this regulation will be reviewed as required in the EPA sunset policy for reporting requirements and regulations.

Dated: December 12, 1980.

Douglas M. Costle,

Administrator.

It is proposed that 40 CFR Part 61 be amended by adding a new Subpart K as follows:

Subpart K—National Emission Standard for Benzene Emissions from Benzene Storage Vessels

Authority. Secs. 112, 114, and 301(a) of the Clean Air Act as amended (42 U.S.C. 7412, 7414, and 7601(a)), and additional authority as noted below.

Subpart K—National Emission Standard for Benzene Emissions from Benzene Storage Vessels

§ 61.120 Applicability and designation of source.

(a) The source to which this subpart applies is each storage vessel that is storing benzene and that has a storage capacity greater than 4 cubic meters. This subpart does not apply to storage vessels used for storing benzene at coke oven byproduct facilities.

(b) While the provisions of this subpart are effective, a designated source that is also subject to the provisions of 40 CFR Part 60 shall only be required to comply with the provisions of this subpart.

§ 61.121 Definitions.

Terms used in this subpart are defined in the Act, in Subpart A of this part, or in this section as follows:

"Benzene" means benzene having a specific gravity within the range of specific gravities specified for Industrial Grade benzene in ASTM-D-836-77. This specification includes Industrial Grade benzene, Nitration Grade benzene, and Refined benzene-535. (Permission will be sought from the Director of the Federal Register to incorporate this ASTM specification by reference.)

"Existing storage vessel" means each storage vessel that stores benzene and that was used to store benzene at any time prior to the proposal date of this standard.

"Fixed capital cost" means the capital needed to provide all the depreciable components.

"Internal floating roof" means a cover that rests upon the liquid surface inside a storage vessel having a permanently-affixed roof.

"Liquid-mounted seal" means a foam- or liquid-filled primary seal mounted in contact with the liquid between the wall of the storage vessel and the floating roof continuously around the circumference of the storage vessel.

"Metallic shoe seal" includes, but is not limited to, a metal sheet held vertically against the wall of the storage vessel by springs or weighted levers and is connected by braces to the floating roof. A flexible coated fabric (envelope) spans the annual space between the metal sheet and the floating roof.

"New storage vessel" means each storage vessel that is initially filled with benzene after the proposal date of this standard. Included are each vessel newly constructed and each vessel constructed prior to the proposal date of this standard.

"Primary seal" means the lower seal forming a continuous closure between the wall of the storage vessel and the internal floating roof.

"Reconstruction" means the replacement of components of an existing source to such an extent that:

(a) The fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable, entirely new source; and

(b) It is feasible, considering economic impacts and the technological problems associated with retrofit, to meet the applicable standard for new sources set forth in this subpart.

"Secondary seal" means the upper seal forming a continuous closure between the wall of the storage vessel and the internal floating roof.

"Storage vessel" means each tank used for the storage of benzene.

§ 61.122 Emission standard and compliance provisions.

(a) The owner or operator of each storage vessel to which this subpart applies shall reduce benzene emissions to the atmosphere by meeting the following equipment and procedural requirements, or equivalent as provided in § 61.123.

(1) The owner or operator shall equip each storage vessel with a fixed roof in combination with an internal floating roof meeting the following specifications:

(i) The internal floating roof shall rest on and be in direct contact with the surface of the benzene liquid inside the storage vessel at all times, except during initial fill and those intervals when the storage vessel is completely emptied and subsequently refilled.

(ii) Each opening in the internal floating roof, except for automatic bleeder vents and leg sleeves, shall be equipped with a cover, seal, or lid which is in a closed position at all times (i.e., no visible gap), except when the device is in actual use. Automatic bleeder vents are to be closed at all times when the roof is floating, except when the roof is being floated off or is being landed on the roof leg supports.

(2) The owner or operator shall equip each storage vessel with a continuous closure device between the wall of the storage vessel and the edge of the internal floating roof. The closure device is to consist of a liquid-mounted seal and a secondary seal.

(b) The owner or operator of each storage vessel shall meet the requirements of paragraph (a) of this section, as follows:

(1) The owner or operator of each existing benzene storage vessel shall meet the requirements of paragraph (a) of this section no later than 90 days after the effective date, unless a waiver of compliance has been approved by the Administrator in accordance with § 61.11.

(2) The owner or operator of each new benzene storage vessel shall meet the requirements of paragraph (a) of this section prior to filling the storage vessel with benzene; except that if the storage vessel was filled with benzene between the proposal date of the regulations and the effective date, the owner or operator shall meet the requirements of paragraph (a) of this section on the effective date.

(c) The owner or operator of each storage vessel to which this subpart applies shall meet the following requirements after installing control equipment to comply with § 61.122(a):

(1) Visually inspect the internal floating roof, the primary seal, and the secondary seal prior to filling the storage vessel with benzene.

(i) If the owner or operator finds holes, tears or other openings in the primary seal, the secondary seal, or the seal fabric, or defects in the internal floating roof, or both, the owner or operator shall repair the items before filling the storage vessel.

(2) Visually inspect the internal floating roof and the secondary seal through manholes and roof hatches on the fixed roof at least once every 3 months.

(i) If the owner or operator finds that there is benzene accumulated on or defects in the internal floating roof, the internal floating roof is not resting on and in direct contact with the surface of the benzene liquid inside the storage vessel, there are visible gaps between the secondary seal and the wall of the storage vessel, or there are holes, tears, or other openings in the secondary seal or the seal fabric, the owner or operator shall repair the items or empty the storage vessel within 30 days.

(3) Visually inspect the internal floating roof, the primary seal, and the secondary seal whenever the storage vessel is emptied and degassed, but at least once during each 5 year period after installing control equipment to comply with § 61.122(a).

(i) In the case of the periodic 5-year inspection, notify the Administrator in writing at least 30 days prior to the refilling of each storage vessel to afford the Administrator the opportunity to have an observer present for inspecting the storage vessel prior to refilling.

(ii) If the owner or operator finds that the internal floating roof has defects, the primary seal has holes, tears, or other openings in the seal or the seal fabric, or the secondary seal has holes, tears, or other openings in the seal or the seal fabric, the owner or operator shall repair the items as necessary so that none of the conditions specified in this paragraph exist before refilling the storage vessel with benzene.

(d) Upon reconstruction, an existing storage vessel shall be considered a new storage vessel for purposes of this subpart. If it is in compliance with the requirements of § 61.122(a) for new storage vessels, it is exempt from the requirements of § 61.07.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414)

§ 61.123 Equivalent equipment and procedures.

(a) Upon written application from any person, the Administrator may approve the use of equipment or procedures which have been demonstrated to his satisfaction to be equivalent in terms of reducing benzene emissions to the atmosphere to those prescribed for compliance with § 61.122(a) of this subpart. For an existing source, all requests for using an equivalent method as the inital means of control is to be submitted to the Administrator within 30 days of the effective date of the standard. For a new source, all requests for using an equivalent method is to be submitted to the Administrator with the application for approval of construction or modification required by § 61.07.

(b) Determination of equivalence to the specified equipment required in § 61.122(a) will be evaluated using the following information to be included in the written application to the Administrator:

(1) By an actual emissions test which uses a full-size or scale-model sealed storage vessel that accurately collects and measures all benzene emissions from a given control device, and which accurately simulates wind and accounts for other emission variables such as temperature and barometric pressure. The test facility shall be subject to prior approval by the Administrator. Or,

(2) By an engineering evaluation where the Administrator determines that the evaluation is an accurate method of determining equivalence.

(c) The Administrator may condition approval of equivalency on requirements that may be necessary to ensure operation and maintenace to achieve the same emission reduction as the requirements of § 61.122(a).

(d) If in the Administrator's judgment an application for equivalence may be approvable, the Administrator will publish a notice of preliminary determination in the **Federal Register** and provide the opportunity for public hearing. After notice and opportunity for public hearing, the Administrator will determine the equivalence of the alternative means of emission control and will publish the final determination in the **Federal Register.**

(e) A metallic shoe seal is considered an equivalent control device to the liquid-mounted seal required in § 61.122(a)(2). Rim vents will be set to open when the roof is being floated off the leg supports or at the manufacturer's recommended setting.

(f) The following system will be considered an equivalent system to that described in § 61.122(a), if it is approved by the Administrator:

(1) A vapor recovery system which collects all benzene vapors and gases discharged from the storage vessel, and a vapor return or disposal system which is designed to process such benzene vapors and gases so as to reduce their emission to the atmosphere by at least 95 percent by weight and which is operated at the design specifications to achieve this emission reduction. The efficiency of the vapor control system shall be calculated by comparing the controlled emissions to those emissions which would occur from a like-sized fixed-roof storage vessel without a vapor control system.

(2) In requesting approval for use of the vapor recovery system described in paragraph (f) of this section, the owner or operator shall provide the Administrator with the following information:

(i) Emission data, if available, for a similar vapor recovery and return or disposal system used on the same type of storage vessel, which can be used to determine the efficiency of the system. A complete description of the emission measurement method used must be included.

(ii) The manufacturer's design specifications and estimated emission reduction capability of the system.

(iii) The operation and maintenance plan for the system.

(iv) Any other information which will be useful to the Administrator in evaluating the effectiveness of the system in reducing benzene emissions.

(9) For the purpose of determining equivalence, flares are assumed to reduce benzene emissions to the atmosphere by 60 percent by weight unless demonstrated by emission testing to be more efficient.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414)

§ 61.124 Initial report.

(a) The owner or operator of each existing storage vessel to which this subpart applies and who does not request a waiver of compliance under § 61.10, shall submit along with the report required by § 61.10 a report describing the existing controls.

(1) Where the existing controls do not meet the requirements of § 61.122(a), the owner or operator shall submit, along with the report required by § 61.10, a report describing the control equipment to be installed to comply with § 61.122(a); and

(2) Notify the Administrator in writing at least 30 days prior to the refilling of each storage vessel that was required to be emptied for installation of controls required by § 61.122(a), so that the Administrator has an opportunity to have an observer present to inspect the storage vessel before it is refilled. If it has not been necessary to completely empty the storage vessel to install controls, the onwer or operator shall submit a written report to the Administrator within 30 days after controls are installed. The report shall state the date controls were installed and shall described all deviations in controls from those described in the report submitted in accordance with paragraph (a)(1) of this section.

(b) The owner or operator who obtains a waiver of compliance under § 61.10, shall:

(1) Notify the Administrator in writing at least 30 days prior to the filling of each storage vessel that was required to be emptied for installation of controls required by § 61.122(a), so that the Administrator has an opportunity to have an observer present to inspect the storage vessel before it is filled. If it has not been necessary to completely empty the storage vessel to install controls, the owner or operator shall submit a report to the Administrator within 30 days after controls are installed. The report shall include the date controls were installed and shall describe all deviations in controls from those described in the report submitted in accordance with §61.10.

(c) The owner or operator of each new storage vessel to which this subpart applies shall submit, along with the report required by § 61.07, a report which describes the control equipment on the storage vessel, and which states the expected date for filling the storage vessel. The report shall be submitted to the Administrator at least 30 days prior to filling the storage vessel so that the Administrator has an opportunity to have an observer present to inspect the storage vessel before it is filled.

(d) The owner or operator of each new storage vessel that existed prior to the effective date of these standards shall submit, along with the report required by § 61.10, a report describing the control equipment installed on the storage vessel. The report shall be submitted within 30 days after the effective date.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414)

§ 61.125 Periodic reports.

(a) The owner or operator of each storage vessel to which this subpart applies shall submit a report describing the results of each inspection conducted in accordance with § 61.122(c)(2).

(1) The first report is to be submitted 3 months after the initial report submitted in accordance with § 61.124. The first report shall include a reporting schedule stating the months that the quarterly reports will be submitted. Subsequent quarterly reports shall be submitted according to this schedule, unless a revised schedule has been submitted in the previous quarterly report.

(2) Each report shall include the date of the inspection of each storage vessel and identify each storage vessel in which benzene has accumulated on or there are defects in the internal floating roof, the internal floating roof is not resting on and in direct contact with the surface of the benzene liquid inside the storage vessel, there are visible gaps between the secondary seal and the wall of the storage vessel, or there are holes, tears, or other openings in the secondary seal or the seal fabric.

(3) Where a quarterly report identifies any condition in paragraph (a)(2) of this section the subsequent quarterly report shall describe the measures used to correct the condition, the date of storage vessel was emptied, and the date the condition was repaired.

(b) The owner or operator of each storage vessel to which this subpart applies shall submit an interim report if any condition listed in paragraph (a)(2) of this section was identified and the condition was not repaired or the storage vessel was not emptied within 30 days of the date the condition was first identified. This report shall be postmarked no later than 40 days after the date the condition was identified.

(c) The owner or operator of each storage vessel to which this subpart applies shall submit a report describing the results of the inspection conducted in accordance with § 61.122(c)(3).

(1) The first report is to be submitted within the 5-year period after the initial report submitted in accordance with § 61.124, with subsequent reports during each 5-year period therafter.

(2) Each report shall identify each storage vessel in which the owner or operator finds that the internal floating roof has defects, the primary seal has holes, tears, or other openings in the seal or the seal fabric, or the secondary seal has holes, tears, or other openings in the seal or the seal fabric.

(3) A report shall be submitted 30 days prior to the refilling of each storage vessel describing repairs made, and giving the date of refilling of the vessel so the Administrator has an opportunity to have an observer present to inspect the storage vessel before it is refilled.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414)

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