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Research Triangle Park NC 27711

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VOC Emissions From Petroleum Refinery Wastewater Systems — Background Information for Promulgated Standards

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VOC Emissions from Petroleum Refinery Wastewater Systems — Background Information for Promulgated Standards

Emissions Standards Division

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Radiation
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

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ENVIRONMENTAL PROTECTION AGENCY

Background Information and Final
Environmental Impact Statement
for Petroleum Refinery Wastewater Systems

Prepared by:

10/4/88

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1. The standards of performance would limit emissions of volatile organic compounds (VOC) from petroleum refinery wastewater systems. Section 111 of the Clean Air Act (42 U.S.C. 7411), as amended, directs the Administrator to establish standards of performance for any category of new stationary source of air pollution that ". . . causes or contributes significantly to air pollution which may reasonably be anticipated to endanger public health or welfare."

2. Copies of this document have been sent to the following Federal Departments: Labor, Health and Human Services, Defense, Office of Management and Budget, Transportation, Agriculture, Commerce, Interior, and Energy; the National Science Foundation; and the Council on Environmental Quality. Copies have also been sent to members of the State and Territorial Air Pollution Program Administrators; the Association of Local Air Pollution Control Officials; EPA Regional Administrators; and other interested parties.

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4. Copies of this document may be obtained from:
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1.0 SUMMARY

On May 4, 1987 the Environmental Protection Agency (EPA) proposed new source performance standards (NSPS) for petroleum refinery wastewater systems (52 FR 16334) under the authority of Section 111 of the Clean Air Act. The standards limit atmospheric emissions of volatile organic compounds (VOC) from petroleum refinery wastewater systems. Public comments were requested on the proposal in the Federal Register. There were 12 commenters composed of industry representatives, one industry trade association, and one equipment vendor. The public comments, along with responses to these comments, are summarized in this document. The comments and responses serve as the basis for the revisions made to the standards between proposal and promulgation.

1.1 SUMMARY OF CHANGES SINCE PROPOSAL

In response to the public comments and as a result of reevaluation, certain changes have been made in the proposed standards. The use of equipment, work practice, design, and operational standards to reduce VOC emissions from individual wastewater system components has not changed. Also, the aggregate facility definition remains in the regulation, although the type of change that would constitute a modification and bring an existing facility under the regulation has been changed.

The following are changes made to the standards since proposal:

(1) all refinery wastewater treatment system components downstream of the oil-water separators (with the exception of slop oil facilities) have been excluded from coverage under the regulation. This includes two groups of components: (a) air flotation systems including dissolved air flotation systems (DAF's) and induced air flotation systems (IAF's); and (b) equalization basins and other auxiliary tanks, basins, and equipment located between the oil-water separator and the downstream air flotation system.

These two groups of components have been exempted under the final standards based on a reevaluation of safety concerns, emissions potential, and cost effectiveness associated with control of these facilities. In the case of DAF's, safety concerns raised by commenters cannot be overcome in a cost-effective manner. In the case of both DAF's and IAF's, the overall VOC emission reductions would be negligible without use of a closed vent system and a vapor control device because VOC emissions would be suppressed temporarily only to be emitted downstream of the air flotation system at facilities which cannot be cost-effectively controlled under Section 111 of the Clean Air Act.

Equalization basins and other auxiliary tanks, basins and equipment between the oil-water separator and air flotation system have been exempted for the same reasons. There are no cost-effective methods of VOC emissions destruction or removal that have been demonstrated for these facilities. Further, suppression of VOC emissions at these points in the treatment process merely suppresses temporarily the VOC's downstream to be emitted at other uncontrolled locations.

The regulation of slop oil tanks has been revised slightly. Storage vessels, including slop oil tanks and other auxiliary tanks are now covered under this Subpart only if they are not an affected facility under Subparts K, Ka, or Kb of 40 CFR Part 60. Slop oil tanks and other auxiliary tanks covered under this NSPS are required to have a tightly sealed fixed roof. The requirement that slop oil be collected, stored, recycled, and transported in an enclosed system prior to reuse, disposal, or resale remains unchanged, except for the inclusion under the standards of oily wastewater drawn from slop oil handling equipment.

(2) The requirement to ensure "no detectable emissions" from seams, joints, seals, and gaskets on junction boxes, oil-water separators, and other equipment having atmospheric or pressure control vents has been deleted in the final standards. For these vented facilities, an initial visual inspection and semiannual inspections thereafter, coupled with follow-up repairs or maintenance, is sufficient for monitoring purposes. The requirement that closed vent systems be monitored to ensure no detectable VOC emissions (defined as 500 ppm above background levels) has not been changed.

(3) The aggregate affected facility definition included in the proposed standards has been retained, but includes two changes. One change is that air flotation systems and other equipment downstream of the oil-water separator are no longer included in the aggregate facility because such facilities are not covered under the final standards. The second change is that installation of a new individual drain system rather than any physical or operational change is necessary to constitute a "modification" to the aggregate facility. In this case, individual drain system means all process drains connected to the first common downstream junction box. If a new individual drain system is constructed that results in increased emissions, the individual drain system together with its ancillary downstream components, to and including the oil-water separators, would be an affected facility subject to the requirements of Subpart QQQ.

(4) A new paragraph at Section 60.690(b) has been added to the regulation concerning modification. This provision alters the application of the definition of modification in the General Provisions (40 CFR Section 60.14) such that the addition of a new individual drain system will be considered a modification to an aggregate affected facility. This change eliminates the capital expenditure exemption contained in Section 60.14(e) for the addition of new individual drain systems for aggregate facilities, making the addition of any new individual drain system a modification of the aggregate facility without regard to cost. The change also ensures, however, that small physical or operational changes made by the refiner that do not significantly increase emissions will not trigger the applicability of the standards for aggregate facilities.

(5) The final rule has been revised to require that vented junction boxes be equipped with vent pipes having a maximum diameter of 10.2 centimeters (4 inches) and a minimum length of 90 centimeters (36 inches). This change has been made to reduce VOC emissions from junction box vent pipes, which are necessary to eliminate the buildup of potentially explosive vapors, but whose dimensions can significantly affect VOC emission potential.

(6) The inspection schedule for water seals in process drains has been revised. Drains that are kept in active wastewater collection service and are consequently maintained by use, as well as by precipitation and maintenance washing, shall be inspected monthly, rather than weekly as proposed. However, for drains that are removed from active service, there is no assurance that use, precipitation, or maintenance washing will maintain the water seal. Consequently, a weekly visual or physical inspection of the water seal is still required. However, if a tightly sealed cap or plug is installed on drains that are not in active service, then semiannual inspections are required.

(7) The final rule has been clarified as to what is required when an oil-water separator that was already fully or partially covered at the time of proposal is modified or reconstructed. A modified or reconstructed oil-water separator shall be equipped with a roof over the entire separator tank. If at the time of proposal (May 4, 1987) a separator is already equipped with a fixed roof over the entire separator tank and the facility is modified or reconstructed, the roof shall be tightly sealed. If the separator has a design capacity to treat 38 liters per second [600 gallons per minute (gpm)] or more of refinery wastewater, the vapor space shall be vented to a VOC recovery or destruction control device. As an alternative to a fixed roof vented to a control device, a floating roof may be installed.

If a partial fixed roof was in place at the time of proposal and the oil-water separator has a design capacity to treat 38 liters per second (600 gpm) or more, upon modification or reconstruction the remainder of the oil-water separator shall be covered with a fixed roof and the vapor space shall be vented to a control device. As an alternative to a fixed roof and control device, the partial fixed roof may be removed and the entire oil-water separator covered with a floating roof.

If a partial fixed roof was in place at the time of proposal over a portion of the separator tank and the oil-water separator has a maximum design capacity to treat less than 38 liters per second (600 gpm), upon modification or reconstruction the remainder of the separator tank shall be covered with either a floating roof or a tightly sealed fixed roof, but shall not be required to vent vapors to a recovery or destruction device.

(8) The recordkeeping and reporting requirements applicable to closed vent systems have been revised to require that certain information about the operation of the control device be maintained. For facilities using a thermal incinerator, continuous records must be maintained of the temperature of the gas stream in the combustion zone of the incinerator. Also, records of all 3-hour periods during which the average temperature of the gas stream in the combustion zone of the thermal incinerator is more than 28°C (50°F) below the design temperature must be maintained and reported semiannually. Similarly, for facilities using catalytic incinerators, continuous records of the temperature of the gas stream both upstream and downstream of the catalyst bed must be maintained. Also, records of all 3-hour periods during which the average temperature measured before the catalyst bed of a catalytic incinerator is more than 28°C (50°F) below the design gas stream temperature, and all 3-hour periods during which the average temperature difference across the catalyst bed is less than 80 percent of the design temperature difference across the catalyst bed must be maintained and reported semiannually. For facilities using a carbon adsorber, continuous records of the VOC concentration level or reading of organics of the control device outlet gas stream or inlet and outlet gas stream must be maintained. Records of all 3-hour periods during which the average VOC concentration level in the exhaust gases of a carbon adsorber is more than 20 percent greater than the design concentration level must be reported semiannually to the Administrator.

1.2 SUMMARY OF IMPACTS OF PROMULGATED ACTION

1.2.1 Alternatives to the Promulgated Action

The regulatory alternatives are discussed in Chapter 6 of the Volume I background information document (BID) for the proposed standards (EPA-450/3-85-001a). These regulatory alternatives reflect the different levels of emission control that were analyzed in determining best demonstrated technology, considering costs, nonair quality health, and environmental and economic impacts for petroleum refinery wastewater systems. These alternatives remain the same.

1.2.2 Environmental Impacts of the Promulgated Action

The final standards would reduce atmospheric emissions of VOC from about 100 newly constructed process unit drain systems, 30 newly constructed oil-water separators, 18 modified or reconstructed process drain systems, and a small number of modified or reconstructed oil-water separators by about 2,020 megagrams (Mg) per year (2,225 tons per year) in the fifth year of implementation. This is about 60 Mg (65 tons) less than the proposed standards as discussed in Chapter 7 of the Volume I BID, and reflects the exclusion of air flotation systems from the final standards. Implementation of the standards will not result in any adverse solid waste impact or water impact. Therefore, with the changes noted in this section, the analysis of environmental impact in Volume I of the BID now becomes the final Environmental Impact Statement for the promulgated standards.

1.2.3 Energy and Economic Impacts of the Promulgated Action

Energy impacts resulting from the standards are discussed in Chapter 7 of the Volume I BID and have not changed significantly since proposal. The economic impacts of the standards have been revised to reflect the exemption of air flotation systems from the final rule. The fifth year annualized costs by model unit and regulatory alternative are summarized in Chapter 9 of the Volume I BID. The economic impact of the final standards is estimated to be $1.1 million. The economic analysis indicates that no adverse economic impacts on projected facilities are expected to result from the standards.

1.2.4 Other Considerations

1.2.4.1 Irreversible and Irretrievable Commitment of Resources. The regulatory alternatives defined in Chapter 6 of the Volume I BID would not preclude the development of future control options nor would they curtail any beneficial use of resources. The alternatives do not involve short-term environmental gains at the expense of long-term environmental losses. The alternatives yield successively greater short- and long-term environmental benefits, with the alternative upon which the final standards are based providing the greatest benefits. Further, none of the alternatives result in the irreversible and irretrievable commitment of resources. No changes in these considerations have resulted since proposal of the standards.

1.2.4.2 Environmental and Energy Impacts of Delayed Standards. As discussed in Chapter 7 of the Volume I BID, delay in the standards would cause a similar delay in realizing the beneficial impacts associated with the standards. No changes in the potential effects of delaying the standards have occurred since proposal.

1.2.4.3 Urban and Community Impacts. There are no urban and community impacts attributable to the proposed or promulgated standards.

2.0 SUMMARY OF PUBLIC COMMENTS

A total of 12 letters commenting on the proposed standards and Volume I of the BID for the control of emissions of VOC from petroleum refinery wastewater systems were received. A public hearing on the proposed standards was not requested. Written comments were provided by industry representatives, one industry trade association, and one equipment vendor. These comments have been recorded and placed in the EPA docket for this rulemaking (Docket Number A-83-07, Category IV). Table 2-1 presents a listing of all persons submitting written comments, their affiliations and addresses, and the recorded Docket Item Number assigned to each comment.

For the purpose of orderly presentation, the comments have been categorized under the following topics:

2.1 Applicability of the Standards
2.2 Definition of Affected Facility and Modification/Reconstruction
2.3 Selection of Control Technology
2.4 Cost/Cost Effectiveness
2.5 Environmental and Economic Impacts
2.6 Monitoring, Recordkeeping, and Reporting Requirements

2.1 APPLICABILITY OF THE STANDARDS

2.1.1 <u>Comment</u>: Three commenters questioned the need for the standards. One commenter questioned the need to regulate VOC's generally when there is no demonstration that specific chemicals are being emitted which affect health and welfare, nor is there any demonstration that significant quantities of such chemicals are being emitted (IV-D-3, IV-D-5, IV-D-8). One of the commenters questioned whether the standards should apply outside nonattainment areas if the concern is over ozone nonattainment (IV-D-3). Another commenter had the same concern, saying that the definition of volatile organic compound in Section 60.691 of the proposed regulation arbitrarily requires regulation

TABLE 2-1. LIST OF COMMENTERS ON THE PROPOSED STANDARDS OF PERFORMANCE FOR VOC EMISSIONS FROM PETROLEUM REFINERY WASTEWATER SYSTEMS

Commenter/Affiliation	Docket Item Number[a]
Neil J. Wasilk Environmental Representative Sohio Oil Company 200 Public Square Cleveland, Ohio 44114-2375	IV-D-1
R. M. Bodin Manager, Environmental Services Citgo Petroleum Corporation Lake Charles Operations Box 1562 Lake Charles, Louisiana 70602	IV-D-2
Gary M. Whipple Assistant Director of Environmental Affairs Chemicals and Plastics Group Union Carbide Corporation 39 Old Ridgebury Road Danbury, Connecticut 06817-0001	IV-D-3
B. F. Ballard, Director Environment Control Phillips Petroleum Company 12 A4 Phillips Building Bartlesville, Oklahoma 74004	IV-D-4
Allan A. Griggs, P.E. Project Manager Diamond Shamrock Refining and Marketing Company Post Office Box 69600 San Antonio, Texas 78269-6000	IV-D-5

Continued

TABLE 2-1 (CONTINUED). LIST OF COMMENTERS ON THE PROPOSED STANDARDS OF PERFORMANCE FOR VOC EMISSIONS FROM PETROLEUM REFINERY WASTEWATER SYSTEMS

Commenter/Affiliation	Docket Item Number[a]
E. J. Ciechon, Esquire T. T. Zale Sun Refining and Marketing Company Ten Penn Center 1801 Market Street Philadelphia, Pennsylvania 19103	IV-D-6
Steven M. Swanson, Director Health and Environmental Affairs Department American Petroleum Institute 1220 L Street Northwest Washington, D.C. 20005	IV-D-7
U. V. Henderson, Jr. Associate Director Environmental Affairs Research and Environmental Affairs Department Texaco, Inc. Post Office Box 509 Beacon, New York 12508	IV-D-8
R. W. Hawes, Manager J. R. Britt Air and Water Conservation Manufacturing Department Mobil Oil Corporation 3225 Gallows Road Fairfax, Virginia 22037	IV-D-9
J. G. Huddle Director, Environmental Control and Planning Amoco Oil Company 200 East Randolph Drive Post Office Box 6110A Chicago, Illinois 60680	IV-D-10

Continued

TABLE 2-1 (CONCLUDED). LIST OF COMMENTERS ON THE PROPOSED STANDARDS OF PERFORMANCE FOR VOC EMISSIONS FROM PETROLEUM REFINERY WASTEWATER SYSTEMS

Commenter/Affiliation	Docket Item Number[a]
Michael M. DeLeon Air Programs Supervisor Tosco Corporation Avon Refinery Martinez, California 94553	IV-D-11
W. L. Wagner, P.E. President Petrex, Inc. Post Office Box 907 Warren, Pennsylvania 16365	IV-D-12

[a]The docket number for this project is A-83-07. Dockets are on file at the EPA's Central Docket Section.

of organic compounds that are not volatile and/or do not form photochemical oxidants, until the Administrator makes a determination to exempt a compound (IV-D-8). A third commenter stated that several aspects of the proposed rule constituted excessive regulation of very small sources of emissions (IV-D-5).

Response: Emissions of VOC from petroleum refinery wastewater systems represent a significant source of VOC emissions to the atmosphere. The EPA estimates that 55.5 gigagrams (Gg) (61,123 tons) of VOC per year are emitted from wastewater treatment processes at petroleum refineries. Petroleum refinery wastewater systems are part of the source category "Petroleum Refineries: Fugitive Sources." This source category is included in the EPA Priority List (40 CFR 60.16, 44 FR 49222, August 21, 1979, and as amended by 47 FR 31876, July 23, 1982) and ranks third on the list. The Priority List consists of categories of air pollution sources that, in the EPA's judgment, cause or contribute significantly to air pollution that reasonably may be anticipated to endanger public health or welfare. No information was presented to demonstrate that the EPA's judgment in listing this source category is incorrect. The EPA is required by Section 111 of the Clean Air Act to promulgate standards of performance for each source category on the Priority List.

As stated in the proposal preamble on page 16337, these standards regulate VOC emissions that are precursors to the formation of ozone. Ozone is harmful to human health and welfare. In addition to contributing to the formation of ozone, VOC emissions from petroleum refinery wastewater systems include benzene and other potentially toxic constituents such as xylene and toluene. Benzene has been listed under Section 112 of the Clean Air Act as a hazardous pollutant because benzene emissions significantly increase the risk of cancer. Emission controls on VOC's at refinery wastewater systems would also reduce emissions of benzene, xylene, and toluene.

New source performance standards (NSPS) apply uniformly nationwide. Specific geographic areas would be excluded only if unreasonable impacts would result. New source performance standards are not limited only to attainment areas for any pollutant. In the case of petroleum refineries, there is no indication that unreasonable impacts will result from regulation of wastewater treatment systems for refineries in any specific area. In any case, most refineries are located in ozone nonattainment areas, which reinforces the need to reduce VOC's from any new, modified, or reconstructed wastewater treatment system.

With respect to the second commenter's concern about regulation of nonvolatile as well as volatile compounds, EPA is convinced that the definition of VOC in the regulation does not overreach the objective of this NSPS. Clearly, the majority of compounds found in refinery process wastewater streams are volatile and photochemically reactive in nature. In addition, as stated above, most wastewater streams at refineries contain toxic constituents. The emission controls on the wastewater system would provide an added benefit by also reducing emissions of these toxic constituents.

Finally, with respect to the third commenter's concern about excessive regulation of very small sources, the final standards exempt air flotation systems because regulation of DAF's is not cost effective. The cost and economic impacts of regulating individual drain systems and oil-water separators have been analyzed thoroughly and are considered reasonable.

2.1.2 Comment: One commenter recommended that a provision be included in the standards that would exempt facilities with oily wastewater streams containing only heavier hydrocarbon compounds (IV-D-2). Streams containing only these compounds would be expected to have lower emissions than streams containing lighter, more volatile compounds. The commenter specifically recommended that this exemption be in the form of a minimum vapor pressure requirement of 1.5 psia. Another commenter suggested that the exemption be implemented through the use of a minimum relative volatility level (IV-D-3). Without such an exemption, the commenters stated, the standards would impose an economic burden on some facilities without accomplishing a significant reduction in VOC emissions.

Response: A cutoff based on vapor pressure or other measure of volatility for oily wastewater streams was considered during the development of the proposed regulation, but was not adopted because the total vapor pressure of the organics in the wastewater has the potential to vary widely and may change with wastewater loading, composition, and temperature. Among other factors that influence the rate of volatilization are ambient temperature, wind speed over the basin, and the thickness of the oil layer.

An industry survey showed that the organic loading can vary by orders of magnitude for the same wastewater system (see Docket A-83-07, Item No. II-B-45). Although there are no data to reflect the degree of change in organic composition of the wastewater, these changes can result from the loading variations, upset conditions, changes in operation, and the addition of new process units. For these reasons, a vapor pressure cutoff has not been included in the final standards.

2.1.3 Comment: Seven commenters objected to the requirement for installation of fixed roofs on DAF's. The concerns range from poor cost effectiveness (mainly due to low emissions potential); to safety (because of safety concerns, it may be necessary to purge the fixed roof to a VOC recovery or destruction device); to operation (roof would interfere with operation, reduce downstream water quality); and to maintenance (roof would hinder regular maintenance) (IV-D-1, IV-D-2, IV-D-5, IV-D-6, IV-D-7, IV-D-9, IV-D-10).

Response: In response to these comments, EPA undertook a thorough reexamination of the technical, economic, and environmental bases of the application of the NSPS to air flotation systems, focusing specifically on the safety problems and the low emission potential of air flotation systems. As a result of this reexamination, the final standards have been revised to exempt air flotation systems, including both DAF's and IAF's.

The analysis undertaken by the Agency included a telephone survey of refiners with fixed roofs installed on their DAF's, as well as a review of the responses to a telephone survey of vendors conducted prior to the proposal. Further, DAF float disposal methods were reviewed to evaluate potential downstream impacts of controlling these systems. As a result of this analysis, the Agency has determined that a DAF controlled with a tightly sealed roof may pose safety concerns that were not adequately addressed by the proposed standards. An unvented fixed roof may present an explosion and fire hazard in some types of air flotation systems due to the buildup of explosive vapors inside the cover. By purging the space beneath the fixed roof with another gas, such as nitrogen, this safety concern can be alleviated. For a system with the vapor space purged and vented to a control device, the incremental cost effectiveness was estimated to be over $13,000/Mg ($11,800/ton) of VOC. Consequently, EPA concluded there is no cost-effective method of VOC destruction or removal demonstrated for DAF's.

Fixed roof controls on air flotation systems serve to suppress VOC emissions temporarily, rather than to destroy VOC. The VOC emissions that are suppressed temporarily by the fixed roof system are merely transported downstream through DAF effluent and froth. Consequently, the 60 Mg/year (65 tons/year) VOC emission reduction shown in Volume I of the BID actually represents the VOC emissions suppressed temporarily by fixed roof controls on air flotation systems, but emitted downstream at uncontrolled emission points.

The Agency did consider DAF froth recycling as an alternative method for VOC control. However, recycling has not been demonstrated to be a practical method of froth disposal for all refiners because the froth may contain additives such as coagulants. The majority of refiners landfarm or landfill froth rather than recycle it.

Taken together, these considerations led the Agency to decide that the focus of the standards should be on the control of emissions from individual drain systems and oil-water separators, including slop oil tanks, rather than on air flotation systems. Therefore, air flotation systems are not covered by the final standards.

2.1.4 Comment: One commenter stated that equalization basins located upstream from the air flotation system should not be included in the definition of DAF's (IV-D-2). According to this commenter, these are very large basins and it would be difficult to place covers on them. A cover could also be dangerous due to the large surface area and amount of potential air leaks into the cover.

Response: Equalization basins that are part of an air flotation system have been excluded from the final standards for essentially the same reasons that air flotation systems themselves have been excluded (see 2.1.3

above). The recommended method of VOC control is a fixed roof, which, like DAF's, would suppress VOC emissions temporarily only to be emitted at some uncontrolled location downstream. There are no cost-effective methods of VOC recovery or destruction that have been demonstrated for these facilities.

2.1.5 <u>Comment</u>: Two commenters requested clarification of the applicability of the proposed standards to slop oil from oil-water separators and of the requirement in the proposed standards that slop oil be collected and reused or disposed of in an enclosed system (IV-D-8, IV-D-9). The commenters stated that these requirements could extend the applicability of the standards to segments of the refinery operation beyond the wastewater system itself, and could potentially encompass the entire refinery in cases where slop oil is combined with refinery feedstock. The commenters suggested that the provision for slop oil be dropped unless a technical basis for justifying such a requirement can be demonstrated.

<u>Response</u>: The final standards have been revised to clarify the scope of the regulation of slop oil and slop oil tanks. In the final standards, storage vessels including slop oil tanks auxiliary to oil-water separators are regulated. These storage vessels are required to be covered with a tightly sealed fixed roof. The fixed roof can be vented with a pressure control valve which has been set at the maximum pressure necessary for proper system operation, but such that the pressure relief valve is not venting continuously. Such a requirement is both technically feasible and cost-effective in view of the VOC emissions potential of these uncovered facilities.

Emissions from slop oil are regulated under this subpart until the slop oil reenters a process unit or is disposed of. The slop oil and oily wastewater drawn from slop oil handling equipment must be collected, stored, transported, recycled, reused or disposed of in an enclosed system (i.e., it must not be open to the atmosphere). Once slop oil is returned to the process, or is disposed of, it is no longer within the scope of this regulation. Another limitation on the applicability of this subpart to storage vessels including slop oil tanks is posed by the requirements of Subparts K, Ka, and Kb that regulate volatile organic liquid storage vessels, depending on the size of the facility and the vapor pressure of the liquid being stored. The NSPS for petroleum refinery wastewater systems does not apply to storage vessels that are subject to the requirements of Subparts K, Ka, or Kb, although the transportation, recycling, reuse, or disposal of slop oil remains subject to the NSPS for petroleum refinery wastewater systems and must be kept in an enclosed system.

2.1.6 Comment: Four commenters made comments related to the auxiliary equipment in the wastewater system that is regulated by the NSPS (IV-D-7, IV-D-8, IV-D-9, IV-D-10). Three of the commenters suggested that the definition of "oil-water separator" not include operations such as holding tanks, surge tanks, or catch basins where oil separation is incidental to the primary function of the equipment (IV-D-7, IV-D-9, IV-D-10). The commenters suggested that because the rule is based on economic analyses of emissions from specific types of separators [conventional American Petroleum Institute (API) and corrugated plate interceptor], the rule should be limited to only those types of separators.

Response: The definition of oil-water separator in the final rule has been clarified to include wastewater treatment equipment used to separate oil from water consisting of a separation tank, which also includes the forebay and other separator basins, skimmers, weirs, grit chambers, and sludge hoppers. Slop oil facilities including tanks are included in this term along with storage vessels and auxiliary equipment located between individual drain systems and the oil-water separator. This term does not include auxiliary equipment or storage vessels which do not come in contact with or store oily wastewater. Auxiliary equipment includes equipment such as holding tanks and surge tanks.

The rationale for this determination is that oil-water separators are commonly used by most refineries as the first step in refinery wastewater treatment. Since oil-water separators remove most of the VOC with the skimmed oil, the units following this process will have lower VOC emissions. By the same logic it follows that units that either store skimmed slop oil or precede the oil-water separator and receive oily wastewater have similar VOC emission potential as the oil-water separator.

Auxiliary equipment preceding the oil-water separator is subject to the same control requirements as the oil-water separator. That is, for equipment having a design capacity to treat more than 16 liters per second (250 gpm) of refinery wastewater, a fixed roof vented to a control device, or a floating roof is required. For equipment with a maximum design capacity of 16 liters per second (250 gpm) or less, a tightly sealed cover is required or a floating roof may be used.

For portions of the oil-water separator such as the skimming mechanism or weirs where it is infeasible to construct a floating roof, a tightly sealed fixed roof may be installed. A tightly-sealed fixed roof shall also be installed to completely cover other auxiliary storage vessels such as slop oil tanks. If the Agency were to allow a mixture of regulated and unregulated components upstream of the oil-water separator, the effectiveness of the VOC emissions control at the separator would be negated.

The rule does exempt existing individual drain systems with catch basins in their existing configuration, segregated stormwater removal systems, surge tanks that receive only stormwater runoff, non-contact cooling water systems, and any other tanks or basins which are used for storing non-VOC products such as caustic or coagulant. In addition, storage vessels, including slop oil tanks, and other auxiliary tanks covered under Subparts K, Ka, or Kb are exempt from these standards.

Additional cost analyses were also performed to ensure that the cost effectiveness of control for slop oil tanks is reasonable. The cost effectiveness of a fixed roof for a 13,250 liter (3,500 gallon) and 75,700 liter (20,000 gallon) slop oil tank was analyzed. The emission potential for these facilities was calculated based on the VOC content of the slop oil. The cost effectiveness of control was estimated to be $4/Mg ($3.60/ton) to $490/Mg ($445/ton) for a fixed roof on the slop oil tanks. The Agency considers these costs to be reasonable.

2.1.7 <u>Comment</u>: One commenter questioned at exactly what point sludge and/or oil is removed from a separator or air flotation system no longer regulated by the NSPS (IV-D-8).

Response: The final rule regulates slop oil until the slop oil reenters a process unit. Until the slop oil reenters a process unit, it must be stored, transported, recycled, reused, or disposed of in an enclosed system (i.e., it must not come in contact with the atmosphere). Once slop oil is returned to the process, it is no longer within the scope of this regulation. Sludge-handling facilities and sludge (including air flotation froth) are not subject to this NSPS, but are expected to be regulated under the Resource Conservation and Recovery Act.

2.1.8 Comment: Two commenters stated that the proposed standards improperly include refinery wastewater systems that do not have the potential for emitting significant amounts of VOC, such as facilities handling low vapor pressure products (e.g., heavy fuel oils, lubricants, greases, and asphalts) (IV-D-2, IV-D-8). One commenter (IV-D-2) reported that the highest vapor pressure for their feedstock was 0.1 psia.

Response: In response to this comment, EPA undertook an evaluation of the emissions potential of facilities handling low vapor pressure products. As part of this analysis, EPA identified typical feedstocks, feedstock characteristics, and other parameters that would influence VOC emissions such as 10 percent boiling point and wastewater influent temperature. In estimating emissions, EPA used the Litchfield method to estimate the percent volume loss from an oil-water separator under a set of conditions believed to be representative of a facility handling low vapor pressure products.

The conditions used for the Litchfield method were an ambient temperature of 18°C (65°F), a 10 percent boiling point of 232°C (450°F), an influent oil concentration of 880 milligrams per liter (mg/l), and an influent wastewater temperature of 60°C (140°F). These conditions differ from those used in Volume I of the BID to estimate emissions from petroleum refinery oil-water separators in that the 10 percent boiling point is significantly higher to account for the low vapor pressure products and the influent temperature is also higher. The 10 percent boiling point of 232°C (450°F) was chosen based on a review of data received in response to a refinery survey. The influent wastewater temperature of 60°C (140°F) was reported to EPA as a typical influent wastewater temperature for these facilities. The influent temperature is higher because of the higher temperatures necessary to process the heavier hydrocarbons.

Based on these data, EPA calculated a percent volume loss of 12.6 percent, which is equivalent to an emission factor of 420 Kg/million gallons of wastewater, the same emission factor used by EPA in estimating emissions from petroleum refinery oil-water separators. Therefore, because the emission potential of facilities handling low vapor pressure products is equivalent to other refining facilities, they remain subject to the applicability requirements of the final rule.

2.2 DEFINITION OF AFFECTED FACILITY AND MODIFICATION/RECONSTRUCTION

2.2.1 Comment: Three commenters felt that the definition of an individual drain system as presented in the proposed rule was inconsistent with the discussion in the preamble (IV-D-1, IV-D-7, IV-D-8). The commenters stated that the definition in the proposed rule was much more expansive than the definition in the preamble and recommended that the definition in the proposed regulation be revised.

Response: The definition of individual drain systems in the proposed regulation was intentionally worded to include associated sewer lines and other junction boxes that carry oily wastewater down to the receiving treatment unit. The definition in the proposed rule was not intended to differ from the definition in the preamble. The reason for including associated sewer lines and other junction boxes down to the treatment unit is that situations could arise where modified or reconstructed individual drain systems could be subject to the standards while downstream components would not be subject to the standards. With such a mixture of regulated and unregulated components, the effectiveness of the control techniques for individual drain systems would essentially be zero. The definition for individual drain systems in the final rule is consistent with the definition in the proposed regulation.

2.2.2 Comment: Three commenters recommended that the proposed regulation be clarified to exclude tanks, drains, and other ancillary equipment that do not contain oily wastewater and do not generate VOC emissions. One commenter suggested revising the definitions of air flotation systems and oil-water separators to make these exemptions clear (IV-D-7). Another commenter specifically recommended that the requirement for water seals on all individual drains be amended to clearly provide that only drains that receive oily wastewater are to be controlled (IV-D-9). A third commenter recommended that sewers and oil-water separators for once-through cooling water be exempt from the regulation (IV-D-1).

Response: The Agency did not intend for the NSPS to apply to drains, tanks, and other ancillary equipment that do not contain or come in contact with oily wastewater. As stated in the proposed preamble on page 16335, the source category to be regulated includes "any component, piece of equipment, or installation that receives and processes oily water from refinery process units." The regulation has been further clarified to exempt ancillary equipment that is physically separate from the wastewater collection system and does not contain or come in contact with or store oily wastewater, as suggested by the commenters. For example, the regulation would exempt storage tanks for non-VOC products such as caustic or coagulant, surge tanks that receive only stormwater runoff, and non-contact cooling water systems.

2.2.3 Comment: Six commenters recommended that all requirements for sewer lines be clearly defined as including "above-grade" sewer lines only (IV-D-1, IV-D-4, IV-D-7, IV-D-8, IV-D-9, IV-D-10). The commenters expressed concern that the rule, as written, could be misinterpreted to mean that in-ground sewers would have to be excavated to comply with the regulation.

Response: It was not EPA's intent to require excavation of buried sewer lines to comply with the proposed standards. As stated on page 16337 of the preamble to the proposed regulation, the purpose of the standards is to regulate VOC emissions from petroleum refinery wastewater systems at points where the wastewater is exposed to the atmosphere. Therefore, all sewer lines that are not buried underground, down to the receiving oil-water separator, are intended to be subject to the proposed standards. The requirement for sewer lines is that they be covered or enclosed in such a way as to have no visual gaps or cracks in joints, seals, or other emission interfaces. These include above-grade sewer lines, and below-grade sewer lines that consist of open channels or ditches. The definition of sewer line has been clarified to exclude buried, below-grade sewer lines.

2.2.4 Comment: Seven commenters recommended that the definition of an aggregate facility as a separate affected facility be deleted from the proposed regulation (IV-D-1, IV-D-2, IV-D-4, IV-D-5, IV-D-6, IV-D-7, IV-D-9). The commenters stated that a wastewater treatment system is normally designed with excess capacity and VOC emissions are more related to surface area than to oil volume. Further, the commenters stated that there are no data to show that an increase in the loading of VOC-bearing wastes necessarily results in an increase in refinery wastewater VOC emissions. Therefore, in the commenters' view, it is not appropriate to require additional controls as a result of increased throughput or the addition of one new pump, process drain, or process unit. The commenters recommended that the standards should be triggered only when the capacity of the wastewater system is expanded.

Response: The EPA disagrees with the commenters' assertion that an increase in the loading of VOC-bearing wastes does not result in an increase in refinery wastewater system VOC emissions. Although the amount of wastewater surface area exposed to the atmosphere does affect emissions, the concentration of VOC in the wastewater along with other factors, such as vapor pressure and temperature, are also factors in determining the emission potential. As a result, with increases in throughput, the volatile organic loading also increases when the surface area remains constant. In EPA's view, VOC emissions can increase with increased loading even if the capacity of the wastewater system (i.e., surface area) is not expanded.

However, in order to ensure that the application of the standards to downstream components of the wastewater system is triggered only by significant changes to the system that result in emission increases, EPA has amended the definition of affected facility in the final regulation. Under the proposed rule, any physical or operational change made to an aggregate facility that resulted in an emissions increase would have constituted a modification, thereby making the standards applicable to the changed facility and all regulated downstream components of the wastewater system. Under the final rule, the definition of affected facility still includes the "aggregate facility," but the definition has been amended to clarify what constitutes a modification that would bring downstream components under the regulation.

In the final regulation, a new paragraph (b) has been added to Section 60.690 that states that a modification to an aggregate affected facility occurs when a new individual drain system (consisting of process drains connected to the first common downstream junction box) is constructed and tied into an existing wastewater system. Under the final regulation, the new individual drain system and the components of the system downstream from the new individual drain system become an aggregate affected facility. This definition will lead to the control of VOC emissions from new individual drain systems constructed to serve new process units within the refinery, as well as from those constructed to serve existing process units.

The new paragraph (b) also specifies that the capital expenditure exemption contained in Section 60.14(e)(2) of the General Provisions does not apply for the addition of a new individual drain system under this regulation. Section 60.14(e)(2) states that an increase in the production rate of an existing facility is not considered a modification if the increase does not involve a capital expenditure. A capital expenditure is considered to be any expenditure greater than 7 percent of the total capital cost of the facility. The intent of the capital expenditure clause is to exclude minor changes from coverage under the NSPS. The addition of a new individual drain system is considered to be an significant change to the aggregate facility because emissions are significantly increased from downstream components of the wastewater facility. Therefore, under the final regulation, the addition of a new individual drain system to an existing wastewater facility that results in increased emissions would constitute a modification of an aggregate facility, even if no capital expenditure is involved. The capital expenditure exemption is retained for all other physical or operational changes to wastewater treatment system components. A small physical or operational change within an existing individual drain system (such as the addition of a pump) that does not constitute a capital expenditure on the aggregate facility would not be considered a modification of the aggregate facility. However, such changes may still constitute a modification to the individual facility (i.e., the individual drain system).

2.2.5 <u>Comment</u>: Four commenters requested that EPA clarify the definitions of affected facilities for drain systems and the applicability of the modification provisions of the standards. As written, two commenters (IV-D-8, IV-D-10) found it difficult to understand which modified or reconstructed drain systems are required to comply with the standards. Similarly, a third commenter (IV-D-11) stated that it is not clear in the regulation what triggers the broader definition of the aggregate affected facility (i.e., drain system, oil-water separator, and air flotation system) versus only the drain system as the affected facility. This commenter stated that the addition of one drain or similar minor changes should not result in the oil-water separator and air flotation system becoming affected facilities. This commenter suggested clarifying the regulation to explain what situations would trigger the broader definition of "affected facility" and when the "offsetting" of small emission increases through decreases elsewhere in the drain system would be allowed. The fourth commenter (IV-D-6) recommended that EPA make clear in the final regulation that modifications to refinery wastewater systems made between proposal and promulgation will not trigger applicability of the NSPS if those changes do not require increases in the capacity of the affected wastewater system. This commenter noted that, as currently written, the proposed regulation carries a risk to refiners that any operational changes or process unit modifications which increase VOC emissions in affected facilities, no matter how slightly, may trigger applicability of the NSPS. This uncertainty will have a serious impact on the ability of refiners to run their businesses until the uncertainty is removed. According to this commenter, refineries cannot remain competitive if routine changes made now carry significant future costs.

Response: There are two ways in which the definition of affected facilities includes individual drain systems. The first way is by making individual drain systems affected facilities. The second way, which overlaps the first, is by defining an "aggregate" affected facility as an individual drain system together with all downstream components of the wastewater system. Under either definition, the equipment standards and work practice requirements applicable to the individual drain system to control VOC emissions are the same. The primary distinction between the two is in the treatment of each under the modification provisions of the standards.

A change in an existing individual drain system which increases emissions and involves the expenditure of more than 7 percent of the capital cost of the individual drain system would constitute a modification under the individual affected facility definition, making the individual drain system subject to the standards. As discussed in the response to Comment 2.2.4, an "aggregate facility" would become modified upon the construction of a new individual drain system consisting of all process drains connected to the first common downstream junction box, making that system and all downstream components of the wastewater system subject to the standards, regardless of the capital cost incurred.

Further, the definition of modification applicable to an "aggregate facility" has been amended to clarify the type of change to a facility that would trigger the application of the standards. The addition of a new individual drain system is a significant change to the aggregate facility resulting in potentially significant increases in the emissions from the wastewater system and, therefore, would constitute a modification under the aggregate definition irrespective of cost. However, if a minor change to the wastewater system, such as the addition of one drain, was not a capital expenditure on the aggregate facility, then it would not constitute a modification under the aggregate facility definition. If a new individual drain system is installed that results in increased emissions, not only that individual drain system, but all downstream components included in the aggregate facility definition would come under the regulation, even if no capital expenditure is involved. Offsetting of emissions would be allowed for all changes to the wastewater system pursuant to Section 60.14 of the General Provisions. Offsetting of emissions increases through decreases in emissions within the affected facility would be allowed, provided the owner or operator of the facility can adequately demonstrate that there will be no increase in emissions.

The reconstruction provisions remain as stated in Section 60.15 of the General Provisions. Under these provisions, reconstruction means the replacement of components of an existing facility to such an 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 entirely new facility.

2.2.6 Comment: Two commenters stated that oil-water separators and air flotation systems should be subject to the NSPS only if actually modified or reconstructed (IV-D-1, IV-D-7). Modification of these units is best defined in reference to design capacity. The commenters recommended that the definition of aggregate affected facility should be modified to be consistent with 40 CFR Section 60.14(e)(2), which states that "an increase in production rate of an existing facility, if that increase can be accomplished without a capital expenditure on that facility" is by itself not considered to be a modification.

Response: As discussed in the response to Comment 2.1.3, the proposed standards have been amended to delete air flotation systems from the definition of affected facility. Oil-water separators continue to be covered by the standards. Under the final standards, a change in an existing oil-water separator is considered a modification, making the facility an affected facility, if the change meets the specifications of 40 CFR Section 60.14. For existing individual oil-water separators, this includes the provision of 40 CFR Section 60.14(e)(2) requiring an increase in production capacity to be accomplished through a capital expenditure in order to constitute a modification. To this extent, these standards are similar to most other NSPS. However, as described in the response to Comment 2.2.4, the addition of a new individual drain system will trigger modification of the "aggregate facility," which includes the oil-water separator. Consequently, the addition of a new process unit to a refinery to increase production will constitute a modification if the addition of the process unit includes a new individual drain system. Such an addition would be a major physical change in the wastewater treatment system resulting in a potentially significant increase in VOC emissions. This change would constitute a modification of the aggregate facility regardless of whether or not a capital expenditure is made.

2.2.7 Comment: One commenter stated that while increased flows resulting from new process units will change the physical state of the system (i.e., flow equalization tanks may have higher levels, and residence times may be shorter in oil-water separators), it is not clear that the facility (i.e., the wastewater treatment system) has been modified (IV-D-7). According to the commenter, a well-designed wastewater treatment system is capable of dealing with large short-term variations in loading without any physical modifications and without any change in operations.

Response: Under the final standards, the addition of a new process unit to the refinery will not, in itself, constitute a modification. The addition of a new individual drain system to the wastewater system (regardless of whether a capital expenditure is involved) would constitute a modification of the aggregate facility, as defined in the regulations. (See response to Comment 2.2.4 for further detail.)

2.2.8 Comment: One commenter maintained that variations in VOC loadings from changes in the refinery are part of daily routine (IV-D-7). These variations may be attributed to operational changes such as bringing on line equipment idled by lack of demand or by maintenance, operating existing equipment continuously rather than on an intermittent basis, performing periodic procedures such as tank cleaning. The commenter was concerned that these normal variations on refinery operations will result in all facilities being declared modified.

Response: After consideration of the comments received on this issue in response to the discussion in the preamble to the proposed standards, EPA has decided that it is not practical to consider routine variations in wastewater loading as modifications under this NSPS. These variations are not changes to individual affected facilities, such as an oil-water separator or individual drain system, and normally do not involve a capital expenditure. If, however, physical or operational changes result in increased emissions and a capital expenditure is made on either the aggregate or individual facility, that change would constitute a "modification" under the aggregate or individual affected facility definitions, as applicable. As discussed in the response to Comment 2.2.4, the addition of a new individual drain system that results in increased emissions would also constitute a modification of the aggregate facility, regardless of whether a capital expenditure is involved.

2.2.9 Comment: One commenter noted that defining the term "modification" as any increase in loading rate appears to conflict with the Clean Air Act's definition of the term, and is thus beyond the Agency's authority (IV-D-7). The commenter stated that it is clear in the Clean Air Act that a modification must involve either a physical change in a facility or a change in the method of operation. According to the commenter, an increased loading rate is not the same as a change in a method of operation.

Response: After consideration of the issue of increased loading raised in the proposal preamble, and after review of the comments received on this issue, EPA has decided that it is not practical to consider an increase in the loading rate alone as a modification under this NSPS. A modified facility under these final standards is either an existing individual drain system or oil-water separator or an aggregate facility that has undergone a physical or operational change involving a capital expenditure, or an aggregate facility to which a new individual drain system has been added.

2.3 SELECTION OF CONTROL TECHNOLOGY

2.3.1 Comment: One commenter recommended that process drain seal and cover system requirements be relaxed in service areas where corrosive materials in the drain system would cause rapid degradation of the equipment (IV-D-8).

Response: The presence of corrosive material in the drain system is not sufficient reason to relax the requirements for process drain seals and covers. In situations where corrosive materials enter the drain systems it may be necessary to construct the required process drain controls and covers out of the same material that was used to construct the drains themselves. The drains must also be made of material that is resistant to the corrosive action with which the commenter is concerned. Therefore, it is not unreasonable that in these situations the drain seal devices and covers also be made of this same material.

2.3.2 <u>Comment</u>: One commenter disagreed with EPA's statement that it is common practice to use water seals in drains (IV-D-5). The commenter said that water seals are commonly used in sewer lines to prevent vapors from flowing upstream from junction boxes, but are generally not used for individual drains.

<u>Response</u>: Several types of individual drains are used in petroleum refineries. These include a straight vent pipe with no liquid seal, a drain with a p-leg trap that provides a liquid seal in the individual drain, a drain with an external seal pot which also has a liquid seal, and a completely closed drain system. The primary reason for installing drains with liquid seals is for safety. Liquid seals prevent combustible vapors from passing through the sewer system and escaping near potential ignition sources. Because of this, drain seals are commonly used as a fire prevention measure. A liquid seal also can be used as a vapor control device because molecular diffusion of VOC to the atmosphere is significantly reduced and convection effects are eliminated. During the development of the proposed standards, several refineries were identified that employed some type of liquid seal in the drain pipe. Therefore, EPA believes this type of control for drains to be adequately demonstrated.

2.3.3 <u>Comment</u>: Three commenters recommended that the tight seal requirement for junction box covers be deleted given that the junction box cover is vented (IV-D-2, IV-D-4, IV-D-5). The commenters maintained that the additional reduction in evaporation rate does not warrant such a requirement.

<u>Response</u>: As described in the Volume I BID, the emission rate of 0.032 kg/hour (0.07 lb/hr) attributed to vented junction boxes was based on the assumption that junction boxes, although vented, were also equipped with

a sealed cover. To address the question the commenters have raised regarding the reduction in emission rate attributable to sealing the cover, the Agency evaluated data from a study conducted by the Chicago Bridge and Iron Company. In this study, emissions were measured from drums filled with hexane. The data showed a 23 percent reduction in emissions when a cover on the drum was gasketed and clamped, as opposed to an ungasketed cover. This emission reduction is believed to be comparable to the emission reduction achieved when a junction box cover is tightly sealed because the conditions under which the test was performed are believed to be comparable to the conditions within a junction box. As a result, the additional emission reduction due to a gasketed, as opposed to an ungasketed, cover on a vented junction box is estimated to be 0.06 Mg/year (0.07 tons/yr). With an estimated 1,200 junction boxes expected to become affected by the NSPS after 5 years, this amounts to a VOC emission reduction of 72 Mg/year (80 tons/yr) nationwide. The cost of gasketing a junction box cover was also evaluated and was found to be approximately $80/Mg ($73/ton) per junction box. This cost is considered reasonable.

2.3.4 Comment: Two commenters suggested that water seals be provided at the junction box or sump rather than at each individual drain (IV-D-8, IV-D-9). The commenters maintained that this would provide equivalent emissions control and better fire protection. According to the commenters, seals located at the junction box would be less likely to evaporate or freeze during cold weather.

Response: The basic principle used to control VOC emissions from drains and junction boxes is to limit the effects of diffusion and convection on the volatilization of VOC from the wastewater. This can be accomplished by creating a barrier between the atmosphere and the wastewater. For drains, the control technique required by the NSPS is to place a water seal in the drain to form a barrier between the wastewater and the atmosphere. The control efficiency of water-sealed drains has been estimated at proposal to be 50 percent or greater. This would reduce the AP-42 emission factor of 0.032 kg/hr (0.07 lb/hr) for refinery drains to approximately 0.016 kg/hr (0.035 lb/hr). For junction boxes, the mechanism for VOC emissions (i.e., effects of diffusion and convection) are the same as for open drains. In addition, since junction box vent pipes are in the same size range as drains, the VOC emission rate from junction box vents is estimated to be the same as open drains, or 0.032 kg/hr (0.07 lb/hr). Therefore, a water seal on a junction box will also achieve emission reductions of 50 percent or greater. The commenters are correct, then, in stating that a water seal in a junction box provides equivalent emission control as a water seal in a drain. However, the overall emission reduction is not equivalent because there are many more drains than junction boxes in the refinery wastewater system. For example, it is estimated that for every junction box, there are six drains. Placing a water seal at each of the six drains affords greater overall emission reduction than placing a water seal at the junction box only.

As for fire protection, water seals are often used in refineries to prevent combustible vapors from passing through the sewer system and escaping near potential ignition sources. However, as a result of comments received at the August 1984 meeting of the National Air Pollution Control Techniques Advisory Committee (NAPCTAC), EPA further evaluated the potential safety hazard associated with installing water seals in junction boxes. It was determined that a water-sealed junction box could pressurize the drain system, thereby creating a potentially explosive condition. Therefore, EPA did not require water seals for junction boxes in the proposed regulation. This decision was endorsed by one commenter (IV-D-10). The EPA has evaluated an alternative control for junction boxes and, as described further in the response to Comment 2.3.5, specific vent sizes for vents on junction box covers are now required in the final rule.

Finally, in response to the comment that a water seal on a junction box would be less likely to evaporate or freeze, the Agency believes that water seals on individual drains are no more prone to evaporation or freezing than water seals at a junction box. The water seal would be essentially the same no matter where it was placed, and both locations are subject to the same atmospheric conditions and receive the same wastewater. Therefore, the requirement for installing water seals on individual drains remains the same as proposed.

2.3.5 <u>Comment</u>: One commenter (IV-D-2) stated that the technical basis for installing sewer seals for emission reduction is flawed. As described by the commenter, vapors trapped by the sewer drain seals will be emitted via the junction box to prevent the buildup of potentially explosive vapors. The commenter recommended that since sewer seals will not materially reduce emissions, this requirement should be removed from the final standards.

<u>Response</u>: As discussed in the response to the previous comment, the overall emission reductions from process drain seals are greater than from controls on junction boxes because of the greater number of process drains within a process unit. The greater number of drains exposes more surface area and thereby provides greater opportunity for volatilization.

Based on the assumption that molecular diffusion and convection are the primary factors affecting VOC emissions from drains and junction boxes, and in light of the potential safety problems of water seals on junction boxes, vent pipes are allowed to provide safe and effective emissions control from junction boxes. Because the rate of molecular diffusion and convection are influenced by the length of the vent pipe and design of the vent pipe opening, EPA evaluated the effects of different size vent pipes. Since VOC diffusion is inversely proportional to the diffusion path length, the greater the vent pipe length, the lower the rate at which molecular diffusion can transport VOC into the air. Also, the diameter of the vent pipe opening affects the emissions due to convection. Therefore, to restrict emissions from junction box vents due to the effects of molecular diffusion and convection, EPA has determined that a vent pipe having a maximum diameter of 10.2 cm (4 inches) and a minimum length of 90 cm (3 feet) will be required. Thus, a vent pipe is allowed to avoid safety problems, but a maximum diameter and minimum length are specified in order to restrict emissions due to the effects of molecular diffusion and convection.

2.3.6 <u>Comment</u>: One commenter stated that the requirement that API separators have fixed covers and a vapor control vent system as a primary control device is not technically sound (IV-D-2). The commenter explained that it would be very difficult to achieve gas-tight seals on all the openings in the cover and placing a sweep gas under the covers would create a dangerous situation.

The commenter recommended that fixed roofs be the alternate control technology and the floating cover control scheme be the preferred method. A second commenter also endorsed floating cover control as the preferred method (IV-D-10).

Response: The Agency has determined that fixed roofs with vapor control vent systems are the best demonstrated technology (BDT) for oil-water separators. Section 111 of the Clean Air Act requires that standards of performance be based on the best system of continuous emission reduction that has been adequately demonstrated, considering costs, nonair quality health and environmental impacts and energy requirements. Floating roofs were not chosen as the preferred control because floating covers cannot be used on all types of separators; for example, corrugated plate interceptors (CPI). However, EPA has made this requirement flexible by allowing floating roofs as an alternative technology to a fixed roof with a vapor control device. Inclusion of this alternative was endorsed by another commenter (IV-D-10).

The EPA disagrees that purging the vapor space to a control device would be hazardous. Inert gases such as nitrogen, natural gas, or fuel gas have all been used for this purpose. During development of the standards, a refinery was visited that was using natural gas for this purpose. In addition, two other commenters (see Comment 2.4.3) maintained that not using a sweep gas would be hazardous. As a result, as described in the response to Comment 2.4.3, EPA has reevaluated the cost of purging the vapor space of a fixed roof with fuel gas and found this cost to be reasonable.

2.3.7 Comment: Two commenters felt that venting emissions from an oil-water separator to an existing vapor control device may result in safety concerns (IV-D-5, IV-D-11). First, a flame would be present to ignite the potential explosive vapors under the roof. Secondly, emergency flare lines are subject to rapid pressurizations, which could cause a hazardous condition in the separator. Furthermore, according to the commenters, this connector would result in the introduction of air into hydrocarbon transfer lines, a condition that is scrupulously avoided in most hydrocarbon processing facilities.

Response: The use of an existing flare to combust vapors from an oil-water separator would not create safety problems if precautions are taken in the design and operation of the system. First, the flare should not be located in such close proximity to the oil-water separator that ignition of vapors is a serious threat to safety. In the analysis conducted for this standard, it was assumed that the flare would be located as far as 60 meters (200 feet) from the oil-water separator. Second, controls such as a fluid seal or flame arrestor are available that would prevent flashback. These controls were considered in EPA's previous cost analysis. Finally, the use of a purge gas, such as nitrogen, plant fuel gas, or natural gas, and/or the careful control of the total volumetric flow to the flare would prevent flashback in the flare stack caused by low off-gas flow. As described in the response to Comment 2.4.3, EPA has revised the costs associated with venting to a control device to include the cost of a fuel gas purge system. It was found that even with this additional cost, this requirement is cost effective.

The rapid pressure buildup cited by the commenters is typically addressed through the design of the flare system. Contacts with flare vendors indicate that a flare handling an oxygen-laden vent stream should be initially designed to handle the anticipated potential pressure buildup.

2.3.8 Comment: One commenter agreed with EPA that a cover is an effective control device for an API separator (IV-D-11). Beyond the use of a cover, however, the commenter felt there has been no vapor control system demonstrated to be safe and effective for API separators because there were none discussed in the Volume I BID. Consequently, the commenter recommended that control of VOC vapors from API separators through vapor recovery or combustion systems should not be required.

Response: During the development of the NSPS, EPA personnel visited several refineries and found that VOC destruction and recovery systems were in use for controlling the vented vapor space from oil-water separators. Because these technologies are demonstrated for control of VOC emissions, these standards are based on their use. These control systems were described in Chapter 4 of the Volume I BID and include incinerators, flares, process heaters, and carbon absorbers. Another alternative control available for API separators is the use of a floating roof that eliminates the vapor space above the liquid, greatly reducing the potential for volatilization of VOC from the oil layer.

2.3.9 Comment: One commenter said that to use a flare system as a control device, a separator will have to be operated under positive pressure (IV-D-7). This is necessary to prevent leakage of outside air into the flare system and cause a safety hazard. The commenter felt that this increased pressure could result in an increase in VOC emissions.

Response: A refinery visited during the development of the standards vented an oil-water separator equipped with a fixed roof to a control device by purging the vapor space with natural gas at a positive pressure in the range of 1 to 2 cm (0.4 to 0.8 inches) of water. This pressure was adequate to maintain a discharge flow of 75 acfm at 15 psig. The EPA disagrees that this slight positive pressure would cause an increase in VOC emissions. As described in the response to Comment 2.3.10, the control efficiency of a tightly sealed fixed roof is 99.7 percent. The effect of the increased positive pressure would not increase VOC emissions to the atmosphere but may slightly increase the flowrate to the control device.

2.3.10 Comment: One commenter questioned the requirement of venting to a control device for fixed roof-equipped oil-water separators (IV-D-7). The commenter noted there was no basis given in the proposal preamble that venting to a control device would increase the capture efficiency of a fixed roof from 85 to 99 percent.

Response: The 85 percent capture efficiency to which the commenter refers is the capture efficiency that has been estimated for fixed roofs not vented to a control device. The NSPS requires that fixed roofs vented to a control device be operated and maintained in a gas-tight condition (i.e., no detectable emissions as indicated by an instrument reading of less than 500 ppm above background levels). The capture efficiency of a gas-tight fixed roof has been estimated to be 99 percent. This estimate is based on AP-42 emission factors for deck fittings on volatile organic storage tank access hatches. Gasketing and sealing an access hatch was assumed to be comparable to the emission reduction achieved by gasketing and sealing a fixed roof. Deck fitting loss for the access hatch was calculated in terms of lb/linear foot/year and applied to a model tank. The emission reduction achieved with a gasketed fixed roof over the tank was calculated. The calculations showed that an unbolted, gasketed cover on the model tank reduced emissions by 99.7 percent over an uncovered tank.

The actual overall control efficiency for a fixed roof vented to a control device depends on the efficiency of the control device. For flares, the efficiency is estimated to be 98 percent. Therefore, the overall efficiency of a fixed roof with vapors vented to a control device is 97 percent (0.99 x 0.98 = 0.97).

2.3.11 Comment: Four commenters stated that placing a fixed roof on oil-water separators and similar devices creates a serious safety hazard because the potential exists for a buildup of explosive vapors under the cover (IV-D-3, IV-D-7, IV-D-8, IV-D-11). Furthermore, the commenters maintained that covers may actually have a negative impact on the environment if an explosion occurs that has the potential to shut down the treatment facility, resulting in untreated wastewater being discharged.

Response: The Agency believes that a fixed roof is a demonstrated technology for oil-water separators and similar tanks or basins, given that an estimated 85 percent of nationwide crude throughput is processed at refineries that are located in States requiring covered separators. Also, some oil-water separators, such as the CPI design are supplied with fixed covers. Therefore, EPA has concluded that there are no safety hazards associated with fixed roofs beyond those normally experienced by industry.

For DAF's, however, because of the physical design characteristics of the system, and the use of air or gas used for flotation, a greater potential for the buildup of explosive vapors under fixed roofs exists for these units. As discussed in the response to Comment 2.1.3, because of safety and cost considerations the fixed roof requirement for DAF's has been deleted from the final rule.

2.3.12 Comment: One commenter recommended that criteria for covering only part of an oil-water separator, such as the separator forebay where most slop oil can be recovered, be included in the proposed regulation (IV-D-8). Another commenter suggested changing the wording "separator tank" to "separator zone" in the proposed standard since that is the proper designation for that portion of the oil-water separator that was evaluated by the Agency (IV-D-9).

Response: Covering only part of an oil-water separator such as the forebay is not an acceptable control strategy for this regulation. Although some oil may be removed in the forebay, not all oil-water separator designs have a skimming device in the forebay. If the oil is not skimmed, then the effectiveness of a fixed roof on the forebay is negated. Also, the retention time required to separate the oil varies with the inlet oil concentration, which can be extremely variable. Therefore, there is a large emission potential from the entire separator tank, not just the forebay. In addition, EPA has determined that covering the entire oil-water separator tank is cost effective. The incremental cost effectiveness for oil-water separators subject to the standards is about $810/Mg ($735/ton) of VOC controlled by a fixed roof vented to a control device. As discussed in the response to Comment 2.4.3, if the cost of a fuel gas purge system is added, this cost increases slightly to $850/Mg ($770/ton).

Regarding the request of one commenter (IV-D-9) that the term "separator tank" be changed to "separator zone," the intent of the regulation is that the entire separator tank be covered for the reasons stated above.

2.3.13 Comment: One commenter was concerned that EPA used a control efficiency of 85 percent for floating roofs and this efficiency is unrealistically low (IV-D-12). The commenter believes that with one vapor-mounted primary seal a floating roof can achieve at least a 90 percent control efficiency.

Response: The commenter appears to have misunderstood the control efficiency used by EPA in assessing floating roof control for oil-water separators. As described on page 16338 of the proposal preamble, EPA has determined that a floating roof with a liquid-mounted primary seal and a secondary seal can reduce VOC emissions by about 95 percent. The precise emission reduction capability of a well-designed floating roof depends on the seal system and the effectiveness of the refinery's maintenance and repair program.

2.3.14 Comment: One commenter recommended that if a battery-limit oil-water separator is installed at a new, modified, or reconstructed process unit, no controls on the downstream wastewater treatment system should be required (IV-D-10). According to the commenter, battery-limit oil-water separators will eliminate any significant increase in hydrocarbon emissions due to the new operation.

Response: The commenter is referring to an oil-water separator, also known as a unit separator, that is dedicated for use at one process unit. Under the final rule, battery-limit oil-water separators are included in the definition of oil-water separator and as such are subject to the applicable control requirements. Installation of a battery-limit oil-water separator will not cause modification of downstream wastewater treatment components unless, as explained in the response to Comment 2.2.4, an individual drain system is also installed or a capital expenditure is made on the aggregate facility.

2.3.15 Comment: One commenter, noting that some oil-water separators equipped with external floating roofs are installed below-grade, recommended that the regulation be revised to allow an opening in the floating roof for stormwater drainage and removal (IV-D-4). According to the commenter, an opening in the roof is needed to allow stormwater on the floating roof to enter the separator.

Response: The EPA agrees with this comment and has revised the final standards to allow stormwater removal through openings in external floating roofs of oil-water separators. The final standards require that each emergency roof drain be provided with either a flexible fabric sleeve seal or a slotted membrane fabric cover that covers at least 90 percent of the area of the opening.

2.3.16 Comment: With regard to floating covers on oil-water separators, one commenter thought it was unrealistic to require a liquid-mounted primary seal with an allowable gap width of 3.8 cm (1.5 inches) and a secondary seal with an allowable gap width of 1.3 cm (0.5 inches) (IV-D-12). The commenter felt it would be more reasonable and cost effective to reduce the liquid-mounted primary seal gap to 0.63 cm (0.25 inches) and eliminate the requirement for the secondary seal. Two other commenters recommended that floating covers with two vapor-mounted seals should be allowed because vapor-mounted seals are not immersed in oily wastewater, which can weaken the seal structure (IV-D-7, IV-D-9).

Response: The EPA has not allowed gap widths of 3.8 cm (1.5 inches) and 1.3 cm (0.5 inches) for liquid-mounted primary and rim-mounted secondary seals, respectively. Rather, the requirement for liquid-mounted primary seals is that the total gap area between the primary seal and the separator wall not exceed 67 cm^2/m (3.2 in^2/ft) of separator wall perimeter. The gap width between the primary seal and separator wall shall not exceed 3.8 cm (1.5 inches) at any point. For secondary seals, the total gap area between the secondary seal and the separator wall shall not exceed 6.7 cm^2/m (0.32 in^2/ft) of separator wall perimeter. The gap width between the secondary seal and the separator wall shall not exceed 1.3 cm (0.5 inches) at any point. However, as a result of this comment, EPA analyzed three different control scenarios. These were: (1) a liquid-mounted primary seal alone, (2) a vapor-mounted primary seal with no gaps in a secondary seal, and (3) a liquid-mounted primary seal with a secondary seal having the same gap widths as in the proposed standards. These control scenarios were analyzed using test data that were gathered during development of the Volatile Organic Liquid Storage Vessels NSPS (40 CFR Part 60, Subpart Kb).

These data showed that regardless of the type of primary seal, the addition of a secondary seal system always resulted in lower measured emissions. In light of this finding and because a liquid-mounted primary seal with a secondary seal for floating roofs on oil-water separators has been determined to be cost effective, EPA has retained the requirement for a secondary seal.

Next, EPA evaluated test data for both liquid-mounted and vapor-mounted primary seals with secondary seals. The liquid-mounted seal system had essentially the same gap widths as were required in the proposed standards. The vapor-mounted seal system, by contrast, had no gaps between the storage tank wall and either the vapor-mounted primary seal or the secondary seal. The emission test results showed that even with the above-specified gap widths, the liquid-mounted primary seal with a secondary seal had measured emissions that were lower by a factor of 3 compared to the tight vapor-mounted primary seal with a secondary seal. As a result of this analysis, the seal and gap width requirements for floating roofs remain unchanged in the final rule.

With regard to the comment that vapor-mounted seals are beneficial because they are not immersed in the oil and water that can weaken their structure, according to API Publication 2517: Evaporation Loss from External Floating Roof Tanks, this problem previously associated with liquid-mounted seals has been reduced. This is due to recent advances in synthetic compounding that have resulted in materials with increased compatibility with hydrocarbon products.

2.3.17 Comment: One commenter stated that the requirement of using gaskets and latches to make access doors on IAF's gas-tight is too restrictive (IV-D-5).

Response: In response to other comments on air flotation systems as explained in the response to Comment 2.1.3, EPA has concluded that air flotation systems should not be subject to the final rule. Therefore, the commenter's concern has been addressed.

2.3.18 Comment: Four commenters pointed out that covers on air flotation systems raise significant safety concerns (IV-D-1, IV-D-7, IV-D-9, IV-D-10). An unvented fixed cover may present an explosion and fire hazard in some types of units due to the buildup of explosive vapors inside the cover. According to one of the commenters (IV-D-9), either a nitrogen purge system or a large vapor space is required to minimize the explosive atmosphere under the cover. This sweeping of air over the unit's flotation zone surface would offset the control efficiency claimed by EPA in justifying covers for DAF's. Another of the commenters (IV-D-10) noted that the only DAF system with a roof reported on in detail in the BID included a ventilation system to dilute the vapor space. This commenter said that many refiners would not consider Regulatory Alternative II to be a realistic alternative because the composition of the confined vapor space is uncontrolled. The EPA was urged by each of these commenters to remove the requirement to cover DAF tanks.

Response: The Agency agrees that this is a legitimate concern. See response to Comment 2.1.3.

2.3.19 Comment: Installation of covers on air flotation systems will reduce the ability of the operator to visually inspect and monitor the system, according to four commenters (IV-D-1, IV-D-5, IV-D-6, IV-D-7). This will reduce the treatment efficiency, and will result in only minimal reduction of emissions. Operators will be hindered in their ability to notice and promptly repair minor maintenance problems. These commenters believe that, if undetected, these problem could lead to major failure and might require a complete system shutdown to facilitate repairs.

Response: This does not appear to be a significant problem. Access hatches and peep holes allow the operator to monitor the process and make repairs. However, for reasons other than those stated by the commenters, EPA has decided to exempt air flotation systems from the standards as explained in the response to Comment 2.1.3.

2.3.20 Comment: Three commenters made comments related to the reduction of VOC emissions using VOC fugitive emission control programs and source control programs (IV-D-3, IV-D-6, IV-D-8). One commenter said that existing VOC emission control programs in conjunction with sealed process drains and unit oil-water separators are more cost effective than retrofitting existing wastewater treatment systems with the proposed controls (IV-D-6). A second commenter noted that control of oil-water separators is required regardless of the extent of wastewater segregation and reuse upstream (IV-D-8). This commenter maintained that the proposed regulation did not make adequate allowance for downstream controls when extensive source control is provided.

A third commenter stated that the regulation forces the use of add-on control equipment, preventing the possible use of more effective control such as elimination (IV-D-3). This commenter suggested a better approach would allow flexibility to control the problem at its source and that EPA should consider setting a de minimus capacity level below which controls are not needed.

Response: A source control program approach to controlling VOC emissions was considered during development of the proposed standards. This approach relies on a system of identifying problematic wastewater streams and upset conditions, coupled with a series of housekeeping measures tailored to problems arising in each process unit. This alternative, however, was not included for several reasons. First, alternative source control programs, while possibly reducing VOC emissions in some instances, are not based on control techniques that are demonstrated. The EPA cannot establish standards based on control techniques that are not demonstrated. Second, the control techniques used in a source control program may not reduce emissions continuously, and such a program may be difficult to define or enforce. However, as was included in the proposed rule, an alternative emission limitation provision has been included in the final rule. Under this provision, an individual refiner may apply to the Administrator for approval of a source control program tailored to the circumstances at an individual refinery. The alternative control techniques must be shown to be equivalent to the requirements of the NSPS in terms of emission reduction. Contrary to the commenter's statement (IV-D-8), the NSPS does not prevent the use of source control programs, nor does it discourage the use of such programs. Many refiners employ such programs to minimize hydrocarbon emissions for safety reasons. Such programs would still be in use even in the absence of an NSPS.

The EPA did consider the possibility of wastewater segregation and reuse upstream of the oil-water separator. In the proposed standards, drain systems that are designed and used as separate systems for the sole purpose of collecting stormwater runoff were exempted from the standards. The final rule also contains an exemption for cooling water systems using water that does not come into contact with oil or oily water.

Finally, with regard to setting a de minimis emissions level below which controls are not needed, EPA previously determined that such a format for the standards is not feasible. For most refinery fugitive emission sources, it is not feasible to prescribe performance standards because it is impractical or economically infeasible to measure emissions from these sources. For individual drain systems, determining compliance with a performance standard would be prohibitively expensive. In the case of oil-water separators, the principal limitation with a standard of performance concerns the difficulty in measuring emission levels. For these reasons, for petroleum refinery wastewater systems, a combination of equipment, work practice, design, and operational standards was selected for the format of the standards.

The final standards do include de minimis capacity levels below which the standards do not apply. Specifically, oil-water separators with a maximum design capacity to treat less than 16 liters per second (250 gpm) of refinery wastewater are not required by Section 60.692-3 to be equipped and operated with a closed vent system and control device. De minimis cutoffs based on influent oil concentration or vapor pressure were also considered, but were not included in either the proposed or final standards because of the variability in influent oil concentration and the poor correlation between vapor pressure and VOC emissions.

2.3.21 Comment: One commenter said that although the proposed standards allow alternative means of emission limitation to be used to achieve equivalent emission reductions, it may be expensive and difficult to verify equivalent emission reductions (IV-D-8).

Response: Section 111(h)(3) of the Clean Air Act permits the use of alternative means of emission limitation if it will achieve a reduction in emissions of any air pollutant at least equivalent to the reduction in emissions achieved by the applicable standard. The purpose of allowing an alternative means of emission limitation is to encourage the use of innovative technologies or systems of continuous emission reduction. The EPA recognizes that for the petroleum refinery wastewater system source category, verifying an alternative means of emission limitation may be difficult, but owners and operators are at least allowed this alternative if they so choose.

2.4 COST/COST EFFECTIVENESS

2.4.1 <u>Comment</u>: Three commenters stated that neither the extra cost nor the effort of providing water seals in drains and covers with leak detection monitoring on junction boxes is unwarranted (IV-D-2, IV-D-4, IV-D-5). The commenters maintain that covers on junction boxes and visual inspection will accomplish the goals of the NSPS.

<u>Response</u>: The EPA disagrees that requiring water seals in drains is unwarranted. As a first step toward determining which control techniques should be selected as the basis of the proposed standards for individual drain systems, EPA analyzed the annualized cost and cost effectiveness of controlling VOC emissions and the resultant VOC reduction for three alternative control techniques. Also considered were nonair quality health and environmental, energy, and economic impacts associated with alternative control techniques. For individual drain systems, it was found that water seals in drains were a demonstrated technology that could reduce VOC emissions from drains by an estimated 50 percent. In addition, this control was found to be cost effective [$300/Mg ($270/ton) for a typical size new facility]. Therefore, water seals were chosen as the best demonstrated technology for drains and remain the selected control alternative in the final rule.

The Agency does agree, however, that visual inspection, rather than leak detection monitoring for junction box covers, is appropriate. Therefore, as discussed in the response to Comment 2.6.7, the requirement for leak detection monitoring for junction box covers has been deleted from the final rule.

2.4.2 <u>Comment</u>: One commenter stated that the cost to retrofit the proposed drain system controls on older process units would be prohibitive (IV-D-8). This commenter recommended that drain systems in older process units that are modified or reconstructed should be exempted from the regulation by the same logic that was used by EPA to exempt facilities with catch basins.

<u>Response</u>: An analysis of the cost of retrofitting existing process drain systems with p-trap drains was carried out by EPA. The analysis is documented in Chapter 8 of the Volume I BID. The additional cost required to

retrofit such a drain compared to installing a new p-trap drain is the cost for labor and materials for removing the existing drain. Costs used by EPA assumed a 3-man crew using a backhoe with a pneumatic jackhammer to remove concrete around the drain. It was estimated that each drain would take about one-half hour to excavate and remove. Based on these assumptions, EPA estimated that the additional cost to retrofit existing drains with the equipment specified in this regulation is $486 per drain. This results in a cost-effectiveness estimate of about $850/Mg ($770/ton) VOC controlled for retrofitted drains, compared to a cost effectiveness of about $300/Mg ($270/ton) VOC controlled for new drains. This cost-effectiveness level is considerably less than for systems with catch basins [estimated to be about $2,100 Mg ($1,900/ton) VOC controlled] and is considered reasonable in light of the VOC emissions potential of modified or reconstructed individual drain systems at refineries.

2.4.3 Comment: Two commenters stated that due to the potential for an explosive buildup of vapor under fixed roof covers on oil-water separators, a purging system would be necessary (IV-D-3, IV-D-7). The commenters said the costs for purging and controlling the purge stream are not included in the EPA's cost estimates.

Response: As explained in the response to Comment 2.3.6, EPA believes that a fixed roof is a demonstrated technology for oil-water separators. Because of the widespread use of fixed roofs, the Agency does not believe there are safety hazards associated with fixed roofs beyond those normally experienced by industry. Therefore, the requirement for fixed roof control on oil-water separators with a maximum design capacity to treat 16 liters per second (250 gpm) or less remains unchanged in the final rule. For oil-water separators with a design capacity to treat more than 16 liters per second (250 gpm), a fixed roof with the vapor space vented to a control device, or floating roof control is required.

The EPA has reevaluated the cost of purging the vapor space under a fixed roof to a control device. The cost of a fuel gas purge system was calculated for a typical size oil-water separator [47.3 liters per second

(750 gpm)]. The incremental cost effectiveness was found to be $850/Mg ($770/ton), an increase of about $40/Mg ($36/ton) over the cost of venting the vapor space to a control device without purging. These costs are considered reasonable.

2.4.4 Comment: Three commenters objected that EPA assumed that an oil-water separator can be readily vented to an existing vapor control device (IV-D-1, IV-D-5, IV-D-7). However, wastewater treatment facilities are often remote from areas where process units or flares are located, and extensive piping may be required to make a connection. The commenters maintain that the EPA's cost analysis should be based on the purchase and operation of a dedicated control device. According to the commenters, the true incremental cost of this requirement is unreasonably high, and fixed covers provide sufficient control for all separators.

Response: The use of a dedicated control device for the control of emissions from the vent of an oil-water separator was evaluated during the development of this regulation and was found to be too costly under most applications. However, the use of a dedicated flare for the control of these emissions is not necessary in order to attain compliance with the final standards. Two other options are available. The first is to vent the oil-water separator to an existing flare. This option was examined in the development of this regulation, with 60 meters (200 feet) of piping for routing the vent gases to an existing flare being included in the cost analysis. This proved to be a reasonable alternative. The other option available to refinery operators is to use another method of control. This could include either a floating roof over the oil-water separator, or use of another existing control device such as an incinerator, carbon adsorber, boiler, or process heater. The cost of these alternative controls is also considered reasonable.

2.4.5 Comment: One commenter felt that the regulation as proposed will impose a forced retrofit of control equipment on all existing refineries in a very short period (IV-D-2). The commenter maintained that the standards will exact excessive cost for insufficient environmental gain.

Response: The changes to the proposed regulation dealing with the modification of an aggregate facility will ensure that only those modifications to a refinery wastewater system which result in significant increases in emissions will bring an existing wastewater system under the final standards. As explained previously in the response to Comment 2.2.4, a modification occurs when a new individual drain system is constructed or when additions to either the individual or aggregate facility constitutes a capital expenditure. Minor changes in a wastewater system would not constitute modifications. Consequently, it is not anticipated that all existing refineries will be brought under the standards, and that those which are will have undergone significant modifications resulting in increases in emissions. Consequently, the costs of the standards, in terms of requiring facilities to install equipment and operate control technologies, will be focused on those cases where the potential for environmental benefit is greatest.

2.4.6 Comment: One commenter stated that the reduction in evaporation rates that may result from completely sealing the cover on an oil-water separator would be insignificant and not commensurate with the cost of installing and monitoring a seal system (IV-D-4). A second commenter stated that EPA had overestimated the benefits and underestimated the cost of venting a fixed roof on an oil-water separator to a control device (IV-D-7). It was suggested that this requirement be deleted.

Response: The requirement that a fixed roof on an oil-water separator must be completely sealed and the seal system monitored for no detectable emissions is applicable to oil-water separators having a design capacity to treat greater than 16 liters per second (250 gpm) of refinery wastewater. Separators meeting this requirement and having a fixed roof must also vent the vapor space to a control device. As an alternative to a fixed roof with vapors vented to a control device, oil-water separators may be equipped with a floating roof.

The reason for requiring that a fixed roof vented to a control device be completely sealed and monitored for no detectable emissions is based on an analysis of the control efficiency that can be achieved by a fixed roof. The

EPA has shown that a gas-tight fixed roof on a tank can achieve a capture efficiency of 99 percent compared to an uncovered tank (see response to Comment 2.3.10). When vented to a 95 percent efficient control device, the overall effectiveness of venting a gas-tight fixed roof to a control device is 94 percent. This represents a substantial incremental emissions reduction in VOC emissions when compared to the 85 percent efficiency attributed to a fixed roof that is not gas-tight.

In addition to being technically feasible, this technology is also cost effective. As presented in the preamble to the proposed standards, the incremental cost effectiveness of having a gas-tight fixed roof vented to a control device compared to having a fixed roof alone is $810/Mg ($735/ton) for a typical size facility. As discussed in the response to Comment 2.4.3, if the cost of a fuel gas purge system is added, this incremental cost increases slightly to $850/Mg ($770/ton). These costs are considered reasonable.

2.4.7 Comment: Several commenters stated that the cost effectiveness of air flotation system controls is marginal and significantly higher than for other elements in the proposed NSPS (IV-D-1, IV-D-5, IV-D-7, IV-D-9). Two of the commenters (IV-D-7, IV-D-9) observed that the cost effectiveness of such controls will be even worse in the future as the result of other proposed regulations and industry's increasing efforts to minimize waste production. In the view of these four commenters, it is questionable whether the low level of emissions from these facilities warrant control measures. Two of the commenters (IV-D-1, IV-D-5) noted that EPA's own estimates show that fixed roofs on air flotation systems will control less than 180 Mg/yr (200 tons/yr) of VOC nationwide at the end of 5 years.

Response: As stated in Comment Response 2.1.3, the cost effectiveness of a fixed roof with vapors vented to a control device on DAF systems is unreasonably high. This is largely attributable to the lower emissions potential of air flotation systems. In view of the Agency's conclusion that use of a fixed roof without venting the vapors to a control device would result in either a safety hazard or negligible emissions reductions, cost effectiveness and safety considerations have led the Agency to exclude air flotation systems from coverage under the final standards.

2.4.8 Comment: One commenter (IV-D-9) claimed that EPA's technical development and economic bases for imposing controls on DAF's are seriously flawed. According to this commenter, EPA has grossly overestimated VOC emissions from DAF's and has underestimated the costs of controls. For example, the cost for the additional equipment needed to use a nitrogen purge system was not included in the cost analysis, according to this and another commenter (IV-D-10). A nitrogen purge system is needed to reduce the hazards of explosive gases building up under the DAF roof. These commenters recommended that EPA withdraw the proposed controls on DAF's from this rulemaking because the technical basis for them has not been demonstrated and because they are not cost effective.

Response: The emissions estimate used to calculate the cost effectiveness of controls on DAF's was derived from EPA tests on an operating DAF. From these tests, an emission factor of 30 Kg VOC per million gallons of wastewater was developed. This emission factor is still believed to be representative of the types of DAF's used at refineries and the range of conditions under which DAF's are operated.

However, as noted in the response to Comment 2.1.3, air flotation systems have been excluded from the final standards primarily because of safety concerns and the lack of control a fixed roof alone would afford. The Agency agrees with these commenters that a nitrogen purge system would be needed to alleviate safety problems and that those costs were not included in the original cost estimation work. However, the cost effectiveness of controls for DAF's is very high, not because the costs have been underestimated, but because a nitrogen purge system requires that vapors be vented to a control device if VOC emissions are to be controlled. The cost of a fixed roof with a control device, coupled with the relatively small resulting emission reduction, makes the cost effectiveness of controlling these units unreasonable under Section 111 of the Clean Air Act.

2.4.9 Comment: Three commenters stated that the DAF selected for EPA's cost analysis may not be typical (IV-D-2, IV-D-6, IV-D-10). Many of the DAF's being used in the industry are very large [e.g., 30 million liters per day (8 million gallons per day) per tank]. The commenters noted that an equipment supplier has estimated that a DAF roof will add approximately 35 percent to the cost of a new DAF. Retrofit of an existing DAF with a roof will undoubtedly add more, according to these comments. One of these commenters (IV-D-10) and another commenter (IV-D-6) stated that installation of a DAF roof will not only affect initial installation costs, but will also add to ongoing maintenance costs due to the need to remove large roof sections in order to replace internal parts.

Response: The EPA believes the size of the DAF tested is representative of the size range of DAF's in use. The estimate of 35 percent of the cost of the entire DAF is consistent with information gathered from vendors by EPA. The size of the DAF unit should not appreciably affect the percentage of the total cost attributable to the roof because the roof cost [EPA used $215 per square meter ($20 per square foot)] is directly proportional to the roof size. With respect to maintenance, vendors report that DAF roofs can be removed easily, although refiners generally believe the roofs are heavy and difficult to remove.

In any case, as explained in the response to Comment 2.1.3, DAF's have been eliminated from coverage under the final standards for a variety of reasons.

2.5 ENVIRONMENTAL AND ECONOMIC IMPACTS

2.5.1 Comment: One commenter questioned EPA's emission estimates for air flotation systems (IV-D-8). The commenter maintained that EPA's emission estimates overpredict actual emissions because in air flotation units the walls and steady upward displacement of gas caused by the flotation mechanism minimizes wind effects and evaporative emissions.

Response: During the development of the standards, EPA conducted emission tests on four IAF's and one DAF. One IAF was treating non-oily wastewater, so the emission results from this unit were not used to estimate an emission factor. As described in the Volume I BID, air purging was used to test the air flotation systems. Because of the air purging, the emission results represent the emission potential of the systems rather than the actual emissions resulting from a system operating under normal conditions. The VOC emissions measured at these systems were variable. The variation could be due to design and operational differences between the systems, differences in the concentration of hydrocarbon in the wastewater, or differences in the purge rate used during the tests. Therefore, to account for these variations, an average emission factor was calculated from the emission test results to represent emission potential for air flotation systems.

2.5.2 Comment: Two commenters stated that the economic impact of the standards should be reevaluated because the cost impact is major, not minor, and additional review is required under Executive Order 12291 (IV-D-2, IV-D-8). The commenters feel that the economic impact of this regulation is far greater than that listed in the preface to the regulation. Compliance with the proposed regulation in its entirety is estimated to cost a refinery between $2 and 6 million. Applying this estimate to the total industry, an estimate of $130 million to retrofit all refineries is given, not including operating and monitoring costs.

Response: The EPA disagrees with the commenters' contention that the economic impact of the standards is major (i.e., greater than $100 million), not minor. The fifth year annualized costs by model unit and regulatory alternative are summarized in Chapter 9 of Volume I of the BID. These cost estimates show that compliance with the proposed standards will cost the petroleum refinery industry approximately $1.18 million. Under the final standards the economic impact will be $1.1 million. The impact of the final standards is slightly less because of the exemption of air flotation systems from the final rule.

The commenters did submit estimates of what the commenter determined it would cost to comply with the NSPS. Compliance with the proposed regulation was estimated to be $2 to 6 million for one refinery. However, the commenters erred in assuming for these estimates that every single component of the existing wastewater system would be subject to the standards. The final rule is applicable only to new, modified, or reconstructed components of the wastewater system. As described in the Volume I BID, EPA estimates that 100 newly constructed process unit drain systems and 30 new oil-water separators will become subject to the standards. In addition, 18 process drain systems and three oil-water separators are expected to become subject to the standards because of the modification and reconstruction provisions. Thus, as described above, EPA has determined that the economic impact of the standards will be approximately $1.1 million, far less than the $100 million established as the first criterion for a major regulation under Executive Order 12291.

2.6 MONITORING, RECORDKEEPING, AND REPORTING REQUIREMENTS

2.6.1 Comment: Two commenters stated that the requirement for weekly inspection of water seals on drains is unnecessarily stringent and would present a significant burden to the industry given the large number and location of these drains in a refinery (IV-D-7, IV-D-8). According to the commenters, drains are often located in areas that are difficult or unsafe to inspect routinely. The commenters recommended that the inspection frequency for process drains be reduced to once a month. The commenters further state that water seals also tend to be maintained by precipitation, maintenance washing, and use.

Response: The EPA agrees that drains that are kept in wastewater collection service will be maintained primarily by the refinery wastewater that is received from a process unit, as well as by precipitation and maintenance washing. Inspections are still required, however, to make sure that the water seals are present or that seal pots are properly capped. Therefore, the inspection frequency has been reduced to monthly, instead of weekly for drains in active service. For drains that are removed from service, there is no assurance that use, precipitation, and maintenance washing will maintain the water seal. Consequently, a weekly visual or physical inspection is still required unless a tightly sealed cap or plug is installed. A semiannual inspection would be required for tightly sealed caps or plugs on drains not in active service.

2.6.2 Comment: One commenter recommended that the requirement for a flow sensor on the flow vent gases to control devices be eliminated (IV-D-1). The commenter stated that flow measurements of these streams are inaccurate, unreliable, and subject to extensive maintenance requirements.

Response: As stated in Section 60.692-7(f)(4), the proposed regulation requires that a flow indicator be installed on a vent stream to a control device. The regulation does not require that flowrate be measured. Flow indicators are defined as devices which indicate whether gas flow is present in a vent stream. This definition has been included in the regulation to avoid any misunderstanding of the monitoring requirements. The EPA has determined that flow indicators are necessary to ensure that vent streams are being continually routed to appropriate vapor recovery or destruction devices. The Agency has determined that the cost of this monitoring requirement is reasonable.

2.6.3 Comment: One commenter recommended that continuous monitoring of flares by television monitors be allowed in addition to thermocouples and heat sensing devices (IV-D-1). The commenter stated that monitoring by television monitors is equally effective and more reliable.

Response: The EPA has determined that detection of a flame by visual means or by remote video camera is not a suitable monitoring method. If a flare is operating smokelessly it can be difficult to determine if a flame is present. Therefore, continuous monitoring of flares by television monitors has not been included in the final standards.

2.6.4 Comment: One commenter questioned the need for weekly monitoring of IAF's (IV-D-7). The commenter stated that maintaining good workplace habits rather than conducting frequent inspections will guarantee the effectiveness of control devices on these units and suggested that semiannual inspections would be adequate to document whether such good habits are being practiced.

Response: The inspection and monitoring requirements for IAF's have been deleted because, as explained in response to Comment 2.1.3, all air flotation systems have been exempted from the final rule.

2.6.5 Comment: One commenter noted that the definition of "gas-tight condition" in Section 60.691 applicable to IAF's includes a requirement for "no detectable emissions" (IV-D-8). The commenter believes this definition provides a rather uncertain and moving target for compliance because the detectability of emissions can change with improvements in testing instruments and sophistication of testing methods. The commenter suggested that the definition be expanded to include "no detectable emissions as indicated by an instrument reading of less than 500 ppm above background levels."

Response: As discussed in the response to Comment 2.1.3, air flotation systems are not covered under the final standards. However, the comment is still relevant to oil-water separators vented to control devices or other affected facilities with closed vent systems. A requirement of "no detectable emissions" still applies to these facilities.

The requirement for "no detectable emissions" in both the proposal and the final standards already includes the provision suggested by the commenter. As provided in Section 60.691, the term "no detectable emissions" means less than 500 ppm above background levels, as measured by a detection instrument in accordance with EPA Method 21 in Appendix A of 40 CFR Part 60.

2.6.6 Comment: One commenter stated that the time period of 15 days to repair leaking equipment was chosen arbitrarily and could be difficult to meet in some cases (IV-D-8). The commenter suggested that the rule be amended to set forth conditions under which repair may be delayed beyond the 15 days in cases where diligent efforts to complete the repairs within 15 days have been unsuccessful.

Response: Provisions were included in the proposed regulation in Section 60.692-8 for delay of repair if the repair is technically impossible to make without a complete or partial refinery or process unit shutdown. Two commenters endorsed the inclusion of this provision. Provisions for delayed repair are included in Section 60.697(e) (recordkeeping requirements) of the proposed regulation. This section requires that an emission point or equipment problem be repaired or corrected in 15 calendar days with the exception of drains and floating roofs. Drains shall be corrected within 24 hours and floating roofs shall be repaired within 30 calendar days. If the repair is technically impossible to make without a complete or partial refinery or process unit shutdown, the expected date of successful repair of leaking equipment shall be recorded. The Agency feels that 15 days allows ample time for the type of minor repairs that may be necessary (for example, replacing gaskets or seals). Also, the provision for delay of repair for major repairs that may require plant or process unit shutdown allows the refiner sufficient flexibility. Therefore, in the final rule, delay of repair provisions are the same as those proposed.

2.6.7 Comment: Three commenters stated that the applicability of "no detectable emissions" to specific components of the refinery wastewater system and the associated requirement for monitoring using a portable hydrocarbon monitor to detect such emissions was inappropriate and that visual inspection would be sufficient (IV-D-2, IV-D-4, IV-D-5). Specifically, the commenters objected to the application of the standards to equipment with fixed roof controls that are not required to be vented to a vapor recovery or destruction control device, such as junction boxes and oil-water separators.

Response: The final standards have been revised to delete the "no detectable emissions" monitoring requirement for junction boxes, oil-water separators, and other components of the affected refinery wastewater system that are equipped with atmospheric or pressure control vents not vented to a control device. The Agency agrees with the comment that visual inspection coupled with follow-up repairs and maintenance is sufficient to prevent leaks of VOC through faulty or poorly maintained joints, seals, or gaskets. Therefore, the final standards are the same as proposed for visual inspection of all joints, seams, access doors, and other emission sources on junction boxes, sewer lines, oil-water separators and any other components of the refinery wastewater system that are subject to the standards.

For oil-water separators with closed vent systems and other closed systems, such as closed drain systems, the "no detectable emissions" requirement specified in the proposed rule is maintained in the final rule. For closed vent systems, monitoring and inspection would be required of joints, seams, access doors, and other potential emission sources when the facility becomes subject to the standards, and semiannually thereafter to ensure that there are "no detectable emissions as indicated by an instrument reading of less than 500 ppm above background levels." The EPA Method 21 would be the applicable test method for these facilities.

2.6.8 Comment: One commenter recommended that all inspection requirements associated with the proposed regulation should coincide with the inspection requirements in 52 FR 3748: Proposed Standards to Limit Air Emissions of VOC's at Hazardous Waste Facilities (IV-D-7). The commenter made the point that by coordinating the inspection schedules, personnel can perform inspections which will meet the requirements of both regulations.

Response: The commenter is referring to EPA's proposed air emission standards for volatile organic control from hazardous waste treatment, storage, and disposal facilities. The proposed standards cited by the commenter require a monthly leak detection and repair program for equipment such as pumps, valves, and pressure relief devices. Under the petroleum refinery wastewater systems NSPS, EPA is requiring that closed vent systems be monitored for detectable emissions initially and semiannually. This requirement does not discourage an owner or operator from coordinating this inspection with any other inspections they may be required to perform under other regulations. However, separate recordkeeping requirements will still apply.

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16. ABSTRACT

Owners or operators of petroleum refineries would be required to meet certain emissions, design, operation, and work practice standards for their wastewater treatment systems. This report contains a summary of changes to the standards made since proposal, a summary of impacts of the promulgated standards, and a summary of public comments and EPA responses on the proposal.

17. KEY WORDS AND DOCUMENT ANALYSIS

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