

89/03(a)

United States  
Environmental Protection  
Agency

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

May 1993

Air



# **Benzene Waste Operations NESHAP – 40 CFR 61 Subpart FF**

## **Guidance for Review of 90-Day Reports**

**NESHAP**



REVIEW DRAFT FOR REGIONAL OFFICES

GUIDANCE FOR REVIEW OF BENZENE WASTE NESHAP 90-DAY REPORTS  
(40 CFR 61 SUBPART FF)

Prepared by

Chemicals and Petroleum Branch  
Emission Standards Division  
Office of Air Quality Planning and Standards  
United States Environmental Protection Agency

May 1991  
[Revised May 1993]



# TABLE OF CONTENTS

	<u>Page</u>
1. BEFORE YOU GET STARTED . . . . .	1
1.1 Introduction . . . . .	1
1.2 Applicability . . . . .	1
1.3 Controls Required . . . . .	2
1.4 Exemption Based on Total Annual Benzene-in-Waste Quantity (TAB) . . . . .	2
1.5 Exemptions for Individual Waste Streams . . . . .	3
1.6 Special Provisions for Wastewater Treatment Systems . . . . .	4
1.7 Items that Must Be Included in the Report . . . . .	4
2. HAVE REPORTS BEEN SUBMITTED? . . . . .	5
2.1 Status Sheet . . . . .	5
2.2 List of Facilities . . . . .	5
2.3 Assess the Quality and Completeness of the Information . . . . .	6
2.4 Check the Arithmetic . . . . .	6
2.5 Request Additional Information . . . . .	7
3. CHECKLIST FOR PETROLEUM REFINERIES . . . . .	8
3.1 Refinery Capacity and Reported TAB . . . . .	8
3.2 Check for Major Waste Streams . . . . .	9
3.3 Check for Concentrations Reported for After Treatment . . . . .	12
3.4 Check for Organic Wastes that Enter the Sewer . . . . .	13
3.5 Were Wastes with Multiple Phases Properly Analyzed? . . . . .	13
3.6 Check to Determine that the Proper Wastes are Identified for Control . . . . .	14
4. CHECKLIST FOR CHEMICAL PLANTS . . . . .	15
4.1 Check for Major Waste Streams . . . . .	15
4.2 Check for Concentrations Reported for After Treatment . . . . .	17
4.3 Check for Organic Wastes that Enter the Sewer . . . . .	18
4.4 Check to Determine that the Proper Wastes are Identified for Control . . . . .	18
5. GUIDANCE FOR COKE BY-PRODUCT RECOVERY PLANTS . . . . .	19
5.1 Coke Capacity and Reported TAB . . . . .	19
5.2 Check for Major Waste Streams . . . . .	19
5.3 Check for Concentrations Reported for After Treatment . . . . .	20
5.4 Check to Determine that the Proper Wastes are Identified for Control . . . . .	20
6. WASTE MANAGEMENT FACILITIES . . . . .	21
7. SETTING PRIORITIES FOR FOLLOW-UP ACTIVITIES . . . . .	22
ATTACHMENTS: TABLES AND EXAMPLES FOR 90-DAY REPORT GUIDANCE . . . . .	23



## BEFORE YOU START

### GUIDANCE FOR REVIEW OF BENZENE WASTE NESHAP 90-DAY REPORTS

#### 1. BEFORE YOU GET STARTED

The purpose of this document is to provide guidance to regulatory agency personnel in reviewing 90-day reports submitted by the regulated community for the benzene waste operations NESHAP. Although many regional offices and State agencies have already started this process, this document may provide additional suggestions for reviewing reports. Details are provided on which facilities should have filed a report by April 7, 1993, what the report should contain, and typical waste streams that should have been included for different industries (including typical benzene concentrations). The guidance begins with a general discussion of the requirements of the rule and then focuses on checklists for the review of the 90-day reports.

##### 1.1 Introduction

The NESHAP for benzene waste operations (40 CFR 61, Subpart FF) is a "waste-based rule". This term means that the need for air emission controls for individual waste streams at a facility is determined based on the benzene content of the waste stream that is managed. The 90-day report required by the rule is the mechanism by which a facility communicates to you information on the benzene containing waste streams at the facility and, for those streams that must be controlled, how compliance with the rule will be achieved. A brief summary of the requirements of the rule relevant to the review of 90-day reports is presented below. The reader is referred to the complete rule in Subpart FF for more details.

##### 1.2 Applicability

The rule is applicable to chemical plants (SIC 2800), petroleum refineries, and coke by-product recovery plants. In addition, hazardous waste treatment, storage, and disposal facilities (TSDF) that receive wastes from chemical plants, petroleum refineries, or coke by-product recovery plants are subject to the rule. All facilities in these categories are required to submit a 90-day report, even if it is only to state that the facility does not manage any wastes that contain benzene.

##### 1.3 Controls Required

Unless it is demonstrated by the owner or operator that one of the exemption criteria is met, wastes that contain benzene must be controlled to meet the requirements of the rule. The

basic requirement is that each stream be treated to either of the following levels:

- to below 10 ppm; or
- 99 percent or more of the benzene is removed or destroyed;
- or the waste stream is recycled to a production process.

In addition, the treatment process must be controlled for air emissions. Prior to treatment, units in which the waste is managed (for example, tanks, surface impoundments, containers, oil-water separators, and drain systems) must be equipped with the air emission controls specified in the rule. These controls are summarized below:

<u>Unit</u>	<u>Control required</u>
• Tanks, surface impoundments, and oil-water separators	Cover and vent to 95% control device (or NSPS*)
• Oil water separators	Cover and vent to control device (or NSPS*)
• Containers	Cover and submerged fill for pumped wastes
• Individual drain systems	Completely closed system vented to control device (or NSPS*)

\* Acceptable alternative controls are given in the NSPS for the storage of volatile organic liquids and for petroleum refinery wastewater treatment systems.

#### 1.4 Exemption Based on Total Annual Benzene-in-Waste Quantity (TAB)

The rule requires that each owner or operator include in his 90-day report an estimate of the TAB for the facility. TAB is to be calculated as the sum of the annual average benzene contained in all wastes streams at their point of generation that contain greater than 10 percent water or at any time become mixed with water and the resulting mixture is over 10 percent water. At facilities where it is demonstrated that the TAB is less than 10 Mg/yr, no controls are required by the rule. An annual update of the 90-day report is required, however, for those facilities with a TAB that is less than 10 Mg/yr but greater than 1 Mg/yr. Facilities with less than 1 Mg/yr must submit a report to update information whenever there is a process change that could cause the TAB to increase to 10 Mg/yr or more.



Although only benzene containing wastes with 10 percent or more water are included in the estimate of TAB, all waste streams that contain benzene should be reported in the 90-day report. (At facilities that exceed the 10 Mg/yr threshold, all wastes that contain benzene are subject to control, not just those with 10 percent or more water.) The information used by the owner or operator in his estimate of TAB may be based on his "knowledge of the waste" rather than actual waste testing. However, when "knowledge of the waste" is used, it must be convincing and credible to your satisfaction. This is particularly true in cases where small changes in assumptions could cause a facility to exceed the 10 Mg/yr facility threshold for the control and treatment requirements. Agency personnel responsible for implementing the rule have the right to require additional detail or waste test data from the company that submitted the report.

### 1.5 Exemptions for Individual Waste Streams

By **definition**, the following wastes are exempt from all aspects of the rule (including reporting):

- Waste in the form of gases and vapors emitted from process fluids; and
- Waste contained in a segregated (completely separate) stormwater sewer system.

Other streams that must be reported may be exempt from the control requirements of the rule if one of the following criteria is met:

- The waste stream benzene concentration is less than 10 ppm at the point of generation;
- The total benzene contained in any combination of waste streams is less than 2.0 Mg/yr;
- The waste stream is process wastewater and has a flow rate of less than 0.02 liters/minute or is generated at an annual rate of less than 10 Mg/yr; or
- The total benzene contained in untreated and treated process wastewater streams is less than 1 Mg/yr.

(NOTE: The final three exemption conditions listed above are mutually exclusive under the structure of the rule. For example, a facility can not exempt a waste stream from the control requirements using the small quantity exemption of 2 Mg/yr and also exempt different a waste stream because it is a process wastewater with a flow rate of less than 0.02 liters per minute (i.e., using the low-flow exemption).

In addition, facilities using the alternative compliance approach of a target benzene quantity of 6 Mg/yr may exempt select streams from control.

## 1.6 Special Provisions for Wastewater Treatment Systems

The rule allows an owner or operator to use a wastewater treatment system (that includes enhanced biological treatment) to meet the treatment requirements of the rule. However, if the owner or operator chooses this compliance option, and wastes with benzene concentrations above and below 10 ppm are mixed in the system, special provisions apply. These provisions require that all waste management units in the wastewater treatment system in which an affected waste is managed must be equipped with air emission controls until both of the following conditions are satisfied:

- The benzene content of each waste stream entering an uncontrolled unit is less than 10 ppm; and
- The total benzene contained in all wastes at the point where they enter the first units in the system uncontrolled for air emissions is less than 1 Mg/yr. Wastes entering an enhanced biological treatment unit are not included in this determination, and the biodegradation unit does not have to be equipped with air emission controls if the waste entering it contains less than 10 ppm benzene.

## 1.7 Items that Must Be Included in the Report

The following items are required to be included in the report:

- Total annual benzene quantity (TAB)
- A listing of each waste stream that contains benzene;
- An indication of whether each stream will be controlled.

For each waste stream that will not be controlled, the following additional details are required:

- Whether it has more or less than 10 percent water;
- Whether it is process wastewater, product tank drawdown, or landfill leachate;
- Annual waste quantity;
- Average and range of benzene concentrations; and
- The annual benzene quantity.

The report must represent the facility's best estimate of the waste stream characteristics based on existing information and the current configuration and operating conditions. The report may be updated as new information becomes available or as conditions change. As you review the reports, keep in mind that these details are required to be reported, and when they are missing or are suspect, additional information should be requested from the facility.

## GETTING STARTED

### 2. HAVE REPORTS BEEN SUBMITTED?

The first step in the review process is to organize the reports that have been submitted, fill out a status sheet, and determine if adequate information has been submitted for a detailed review. A checklist is provided below for each item, and the following section provides additional details:

1. Prepare a status sheet that lists each of the facilities.
2. Compare the list of companies that filed the report with the list of major facilities that should have reported.
3. Identify those facilities that have not reported.
4. Assess the quality and completeness of the data.
5. Identify those reports for which more information from the facility is needed before a detailed review can be made.
6. Check the arithmetic.
7. Request more information from those facilities not reporting or those with inadequate reports. For those facilities with sufficient information for a detailed review, proceed to the more detailed checklist provided for each of the four industries.

#### 2.1 Status Sheet

An example status sheet is shown in Table 1 and a blank version is provided for copying. One option is to set up the status sheet on a personal computer spreadsheet. The purpose of the status sheet is to provide a summary record of each report that is received, the status of the report and its review, and the priority assigned for follow-up actions. In later sections, additional detailed guidance will be provided to indicate some of the more important findings to note and some suggestions for assigning priorities.

#### 2.2 List of Facilities

A list of facilities that produce wastes containing benzene is given in Table 2. The list includes each of the four affected industries and is sorted first alphabetically by State, then alphabetically by company within each State. Compare the list of companies that filed the report with the list of major facilities

in the table, and identify those facilities that have not submitted a report.

[NOTE: The listing of facilities is not necessarily a complete one, and some of the facilities may have shutdown or changed ownership. Additional cross-checks with other data bases are recommended.]

### 2.3 Assess the Quality and Completeness of the Information

Review the reports to determine if the information that is provided is adequate for a detailed review of the facility's benzene containing wastes. The purpose of this step is to identify those facilities that have provided incomplete or inadequate information, and then to request more information from the facility. Guidance is given below for assessing the quality and completeness of the information in the report:

- Is all of the information presented that is needed to calculate the facility's TAB? Remember that the annual average benzene concentration, the annual waste quantity, and whether the waste is 10 percent or more water are the minimum items needed to calculate TAB for a waste stream.
- Were all of the aqueous wastes (i.e., those with 10 percent or more water) counted in the facility's reported TAB?
- Were the TAB calculations made using conservative assumptions? For example, compare the average concentration with the extreme values given in the range of concentrations. Is the estimate based on the lower or upper end of the range, or is it a midrange value? Although not required as part of the 90-day report, information on the basis for characterization of each waste stream should be reviewed for reasonableness if provided in the report, or this information can be requested by the Regional Office if reported values appear outside the normal range.
- Does a small change in the assumptions result in a facility TAB that may exceed 10 Mg/yr?

### 2.4 Check the Arithmetic

For those reports that provide waste quantities and concentrations, check the arithmetic. Multiply the waste quantity (in Mg/yr) by the benzene concentration (ppm by weight  $\times 10^{-6}$ ) to estimate the TAB in Mg/yr. Note that ppm by weight, mg/kg, and mg/L (for water) are equivalent measures of concentration. Some facilities reported the waste quantity in

units of gallons per day, tons per year, etc. Conversion factors are given below to calculate the waste quantity in Mg/yr:

<u>To convert from:</u>	<u>Multiply by:</u>
gallons/day	1.4
gallons/year	0.0038
tons/day	330
tons/year	0.91
lbs/day	0.17
lbs/yr	$4.5 \times 10^{-4}$
kg/day	0.365
kg/year	0.001

## 2.5 Request Additional Information

Based on the review of the items discussed above, identify those facilities that did not report and those that provided incomplete or inadequate reports. Request additional information. For those facilities that provided adequate information, proceed to the next steps that involve a more detailed review of the contents of the report.

## PETROLEUM REFINERIES

### 3. CHECKLIST FOR PETROLEUM REFINERIES

A checklist is provided below for the review of reports from petroleum refineries. The following sections provide additional details for each item and also show examples from actual reports.

1. Compare the reported TAB and the facility's capacity to those given in Table 3 and in Figure 1.
2. Compare the reported waste streams to the list of wastes expected. Are the benzene quantities and concentrations reasonable?
3. Check for unusually low benzene concentrations. Are the reported concentrations for the waste after it has been treated for benzene removal? [NOTE: Concentration determinations are made before treatment at petroleum refineries except for sour water strippers, where the concentration is determined from the stripper bottoms. To qualify as a sour water stripper, wastes other than sour water can not be stripped in the unit.]
4. Are organic wastes that eventually end up in the sewer included?
5. Did the facility include the benzene in the organic (oily) phase of wastes with multiple phases?
6. Check to determine if the proper waste streams have been identified for control.

#### 3.1 Refinery Capacity and Reported TAB

Table 3 lists the reported TAB from several petroleum refineries and also provides their capacity. The capacity is given in terms of crude oil processed and for the sum of the capacities of all of the other major processes that produce wastes containing benzene. Review of the data on TAB and crude oil capacity indicates that, as a rule-of-thumb, refineries with a crude capacity of greater than forty to seventy thousand (40,000-70,000) barrels per day are likely to exceed a TAB of 10 Mg/yr. However, there are several site-specific factors that can influence the TAB determination at a facility; these include such things as the characteristics of the particular crude oil processed and any waste minimization measures practiced at the facility. One of the first steps in reviewing reports from petroleum refineries is to compare the reported TAB and its capacity (capacities are given in Table 2).

For example, the facilities numbered 19, 22, and 23 in the table have unusually low TAB's compared to their capacity. These facilities probably merit a very close review and may be candidates for requests for additional information. Example 1 is the report from a petroleum refinery with a crude oil capacity of 33,000 barrels per day and a reported TAB of 0.44 Mg/yr. The TAB for this facility appears to be low compared to the values given in Table 3. Example 2 is a refinery with a capacity of 8,000 barrels per day and a TAB of 2 Mg/yr. Although the estimates for Example 2 are made for the waste streams leaving the oil-water separator, they were corrected to account for benzene losses in the collection system. Based on the low capacity for the facility in Example 2, additional information for this facility is probably not needed.

### 3.2 Check for Major Waste Streams

The second step in the review of reports from refineries is to determine if the major waste streams that are expected are reported. One of the most commonly reported waste streams (and the major contributor to TAB) is wastewater from the desalting operation. Examples are given in Table 3 for this waste from several reports. The average benzene concentration for water from desalting ranged from 3 ppm to 86 ppm.

From the table, the facilities numbered 16 and 23 reported unusually low concentrations (3 ppm) for this waste and may be candidates for follow-up activities. Example 1 (33,000 bbl/day) discussed above is one of the facilities that reported an unusually low concentration in the desalter water, perhaps from benzene losses prior to the sampling point or some type of treatment. In addition, Example 1 does not include the large number of wastes found at petroleum refineries (including waste oil and sludges). Example 3 includes wastes that are water and sludges; however, there are no organic wastes reported, such as the oil recovered from the oil-water separator.

Example 4 shows a facility that has reported the benzene in their sour water because it is injected into a deep well. For most facilities, the sour water is stripped and the benzene content is determined after stripping. Example 5 is a report from a refinery that lists many waste streams and is indicative of the types and numbers of wastes expected. Note that certain wastes listed in the example (slop oil, float, sludge) are not counted toward the TAB because they are generated in the waste treatment process, and the benzene was included with other wastes reported on the first page. However, these wastes should be listed to indicate whether they will be controlled. Many facilities did not report these wastes that are generated by waste treatment. The facility in Example 5 also reported the benzene in their sour water stripper feed (SWS feed); however,

the benzene content after stripping should have been reported and would have decreased the TAB.

Additional details are given below for the major waste streams that are expected to be reported by petroleum refineries:

#### Wastewater from crude storage and desalting

Wastewater is generated from crude oil from the separation of residual water from the crude and from water washing of the crude in the desalting process. Benzene concentrations in the range of 8 to 43 ppm are expected based on the original estimates of impacts; however, the review of actual reports showed annual average concentrations that ranged from 3 ppm to 86 ppm. The concentrations for 13 of 16 facilities exceeded 10 ppm; consequently, these wastes are expected to require controls at facilities that exceed the 10 Mg/yr threshold for TAB. Desalter water is one of the most commonly-reported wastes at refineries and is a major contributor to the facility's TAB.

#### Wastewater from atmospheric distillation and gas processing

Wastewater is also generated in the atmospheric distillation of crude (condensed stripping steam) and gas processing (including caustic and water washes). The estimated range of benzene concentrations for these wastewaters is 13 to 320 ppm. One facility reported a benzene concentration of 57 ppm (52 to 62 ppm) in water from gas processing. Another refinery reported a concentration of 13 ppm for wastewater from their crude and vacuum distillation units with a wide range of 0.8 to 130 ppm.

#### Wastewater from catalytic reforming

The catalytic reforming process generates wastewater from the condensation of stripping steam. This condensate is expected to be in contact with an organic layer that contains benzene; consequently, benzene concentrations in the water were estimated as roughly 500 to 630 ppm. One refinery reported that the benzene in water from their reformer ranged from 109 to 700 ppm while another facility reported a concentration of 400 ppm.

#### Wastewater from other processes that contain benzene

Wastewater is also generated from the condensation of steam and separation of water in accumulators from processes such as catalytic cracking, visbreaking, coking, and naphtha sweetening. The expected benzene concentration based on the original analysis is a range of 13 to 320 ppm. Limited data submitted by a refinery indicate that the benzene concentration in naphtha receiver water was 11 ppm (10 to 12 ppm). Several refineries apparently grouped wastes from these processes in the general



category of process wastewater. Consequently, the individual process source of the generically labeled "process wastewater" is not always given in the reports.

#### Tank drawdowns

Wastewater containing benzene is also generated from tank drawdowns, which involve separating water from product tanks. Tanks that hold the lighter organic products are expected to contain higher concentrations of benzene. The estimate used in the impact estimates was a benzene concentration of 13 to 320 ppm. The benzene concentrations that have been reported in water draws from gasoline, jet fuel and naphtha storage are given below:

<u>Facility</u>	<u>Average concentration (ppm)</u>	<u>Range (ppm)</u>
1	--	50 to 75
2	808	55 to 1,000
3	588	37 to 700
4	59	53 to 68
5	20	17 to 21

#### Wastewater from benzene and BTX production

Some petroleum refineries produce benzene or benzene in a mixture of other volatile organics (e.g., BTX). The benzene concentration in wastewaters from these processes was expected to range from 180 to 1,800 ppm. Data available from only one facility indicated that the benzene concentration in water from the B-T column receiver was 1,200 to 1,300 ppm.

#### Slop oil or recovered oil from oily wastewater

Slop oil or skim oil is separated from oily wastewater at the oil-water separator and is sent to a slop oil tank prior to reuse. Benzene concentrations on the order of 8 to 43 ppm were expected in the oil phase based on the original estimates used to develop the rule. This concentration is apparently much too low because concentrations reported by two refineries ranged from 1,600 ppm to 20,000 ppm for benzene in the slop oil. Many refineries apparently did not report the benzene in their recovered slop oil. Note that when a refinery reports the benzene concentration and quantity after the oil-water separator, the benzene in both the oil and water layers should be included. The concentrations reported in the water by the same two facilities (given above for the slop oil) were 7 ppm, (6.4 to 7.5 ppm) and 10.5 ppm.

### Oily sludges

Sludges are also generated as benzene-containing wastes at petroleum refineries; however, several refineries apparently failed to report these wastes. Benzene concentrations in sludge from DAF float, slop oil solids, API separator sludge, and heat exchanger sludge were expected to range from 1 to 100 ppm. Leaded tank bottoms were expected to contain benzene at 10 to 1,000 ppm. Data reported by one refinery indicated a benzene concentration in tank bottoms of 13 to 50 ppm compared to 3 ppm for wastewater treatment sludges.

### 3.3 Check for Concentrations Reported for After Treatment

Did the facility report concentrations that appear to be after waste treatment? For example, low concentrations associated with large waste quantities may indicate that many waste streams were combined, diluted, or sent to a treatment device for removal of benzene. The determination of benzene concentration and quantity must be made for the waste stream before treatment at petroleum refineries except for sour water strippers. For sour water strippers, the benzene quantity used in the calculation of TAB is based on the wastewater leaving the stripper. Examples of reports that appear to be after waste treatment are given in the next section for chemical plants.

(NOTE: The issue of determinations before or after treatment has been confusing to some facilities who have not included the TAB for certain waste streams they identify as being "recycled", or managed in a "closed system", or a part of the process. For example, some facilities plan to "reduce" their TAB by installing separators and/or strippers near the point of generation. These devices can be used to meet the control requirements of the rule; however, the calculation of TAB for applicability determinations must be made for the waste before treatment.)

### 3.4 Check for Organic Wastes that Enter the Sewer

A point of confusion for some facilities is related to organic wastes that enter the sewer system. Some facilities have not included the benzene in organic wastes that enter the sewer in the calculation of TAB because the waste contains less than 10 percent water. However, after the organic waste is mixed with wastewater in the sewer, it becomes an aqueous waste and all of the benzene in this wastewater must be included in the calculation of TAB.

An example is the oil-water separator in a petroleum refinery. Organic wastes can enter the sewer from line drainings, poor separations, spills, pump leaks, etc. As a check on TAB, the facility's total should account for the benzene leaving the separator with the wastewater and the benzene leaving with the slop oil. The concentration of benzene in the slop oil can be as much as 80 to 100 times the concentration in the water.

Refer again to Example 4 and note that the concentration of benzene in the slop oil (500 ppm) is over 100 times the concentration of benzene in the water leaving the API separator (4 ppm). For this example, all of the benzene entering the sewer was probably not reported because of the large quantity of benzene recovered at the oil-water separator. Approximately 16 Mg/yr of benzene leaves with the water from the separator (4 million Mg/yr of waste at 4 ppm). In addition, a total of 42,000 Mg/yr of slop oil (at 500 ppm) is recovered and contains another 21 Mg/yr of benzene. The second page of Example 5 (page 38 of the attachment) lists wastes that were counted before the API separator. Notice that the total for the separator inlet water, float, and sludge (approximately 38 Mg/yr) is reasonably consistent with the TAB provided on the first page of Example 5 (32 Mg/yr).

Example 6 shows a refinery that reported process oil that enters the sewer, but they did not include it in the TAB. This oil contributes 3.3 Mg/yr of benzene to the TAB. Example 7 is a refinery that did not report any oily or other organic wastes, as evidenced by the relatively low concentrations reported. All of this facility's TAB comes from a single waste, desalting water. Example 8 also appears to indicate that all waste streams were not reported. Only a few wastewater streams with relatively low concentrations are listed.

### 3.5 Were Wastes with Multiple Phases Properly Analyzed?

Some facilities have misinterpreted how wastes with multiple phases should be analyzed and how TAB should be calculated. For example, when tank drawdowns or other separations are performed, a water layer is usually removed first, followed by a small layer of interface material (sometimes), and then some of the organic

product or waste. Some facilities have included only the benzene in the water layer in the TAB and concentration determinations. However, the waste stream is composed of all of the layers and the total TAB should include the benzene in the organic and aqueous layers. In addition, the average benzene concentration should be calculated from the mass-weighted contribution of each layer.

Example 9 shows a refinery that apparently had difficulty in sampling and analyzing wastes with multiple phases. Note the very wide range of concentrations given, such as 26 to 12,000 ppm. They understood that benzene in the oil phase should be included; however, additional information should probably be requested because this facility is marginally under the 10 Mg/yr threshold. The type of information that might be helpful is their measure of concentration for each phase, the relative amounts of each phase, and how they determined these values. The waste stream labeled No. 19 in Example 10 was identified as oily wastewater; however, the benzene concentration was only 5.6 ppm. This facility may also be a candidate for more information to be sure that they analyzed the oil phase in the oily wastewater for benzene and included it in the TAB. Example 11 does not include any oily wastes, and the relatively low concentrations reported suggest that the oil phase was not analyzed and included.

### 3.6 Check to Determine that the Proper Wastes are Identified for Control

For facilities with a TAB of 10 Mg/yr or more, check to determine if the proper waste streams have been identified for control. Note particularly that organic wastes and sludges with 10 ppm or more benzene are listed for control. Is it clear why certain wastes are listed as not requiring control? For example, is the concentration less than 10 ppm, or does the waste qualify for the small quantity exemption of 2 Mg/yr or the low flow exemption for process wastewater (less than 10 Mg/yr or 0.02 L/min)?

Re-examine Example 3 for wastes that will be controlled. The "tank bottom sludges" (13 ppm) should be listed for control. It is not clear why the "ballast water" (7 ppm) is listed for control, while the "tank water bottoms" (50 ppm) are not to be controlled. This facility should be contacted for clarification before they complete the installation of controls. Also take another look at Example 5. Why is the "CPI sludge" (120 ppm) not listed for control? On the other hand, why is the "tank drawdown for sweet crude" listed for control when the reported concentration is 8.7 ppm?

## CHEMICAL PLANTS

### 4. CHECKLIST FOR CHEMICAL PLANTS

1. Compare the reported waste streams to the list of wastes expected. Check the benzene quantity and concentration for reasonableness.
2. Check for benzene concentrations that may have been reported for the waste after it has been treated for benzene removal.
3. Are organic wastes that eventually end up in the sewer included?
4. Check to determine if the proper waste streams have been identified for control.

#### 4.1 Check for Major Waste Streams

The wastes generated at chemical plants are much more diverse than those found at petroleum refineries because of the diversity in the use of benzene as a raw material, making it as a product, or finding it as a by-product in wastes. The types of wastes include wastewaters that are generated from direct contact cooling or heating, from phase separations in organic chemical processes, and from aqueous washes. Organic wastes and sludges are also generated at these facilities and may contain benzene.

The types of wastes to expect and the range of TAB that is reported depends on the type of chemical processes that are present and the facility capacity. The types of chemical plants that are likely to produce wastes that contain benzene include those that produce the following chemicals: benzenesulfonic acid, benzene, benzophenone, chlorobenzene, cumene, cyclohexane, ethylene, ethylbenzene, hydroquinone, linear alkylbenzene, nitrobenzene, resorcinol, sulfolane, and styrene.

Typical examples are given below for several chemical plants that have filed their 90-day reports:

- a. Plant A produces ethylene, propylene, butadiene, benzene, alcohols, plasticizers, acetates, and synthetic elastomers. They reported a TAB of 35 Mg/yr and the major waste streams were:

- Equipment cleaning water, >10 ppm, 5.5 Mg/yr
- Tank water draw, 273 ppm, 1.2 Mg/yr
- Benzene equipment cleaning water, >10 ppm, 1.5 Mg/yr
- Water drain from process area, 959 ppm, 1.7 Mg/yr

- Water draw from heavy naphtha, 60 ppm (range of 7 to 400 ppm), 17 Mg/yr
  - Basic (high pH) water, 88 ppm (range of 20 to 100 ppm), 2 Mg/yr
- b. Plant B produces styrene and reported a TAB of 74 Mg/yr.
- Water wash of ethylbenzene, 84 ppm, 1.2 Mg/yr
  - Water wash of ethylbenzene, 703 ppm, 1.2 Mg/yr
  - Water in the process sewer, 513 ppm, 71.5 Mg/yr
- c. Plant C produces various organic chemicals and plastics and reported a TAB of 9.5 Mg/yr.
- Water from NaOH decanter in olefin production, 160 ppm, 2.2 Mg/yr
  - Water draw from naphtha tank, 28 to 34 ppm, 0.6 to 0.8 Mg/yr
  - Water draw from dripolene tank, 350 ppm, 0.5 Mg/yr
  - WWT influent, 0.2 to 5.9 ppm, 0.7 to 18 Mg/yr (used 9.5 Mg/yr)
- d. Plant D produces ethylene, vinyl chloride, linear alkylbenzene, and normal paraffins with a reported TAB of 554 Mg/yr.
- Quench tower blowdown, 21.5% (range 5 to 22%), 49.7 Mg/yr
  - Wastewater tank, 250 ppm to 0.4%, 485 Mg/yr
  - Ethylene drainage area, 0.9% (range 10 ppb to 45%), 3.3 Mg/yr
  - Caustic tank cleanout, 3.8% (range 10 ppm to 5%), 2.2 Mg/yr
  - Ethylene flare sump, 21.5% (range 5 to 45%), 1.5 Mg/yr
  - Slop oil (not included in TAB), 7.6% (range 250 ppm to 45%), 923 Mg/yr!
- e. Plant E reported a TAB of 76 Mg/yr from their benzophenone process.
- f. Plant F reported a TAB of 5.2 Mg/yr from these wastes:
- Aniline-amine stripper tails, 20 ppm, 3.3 Mg/yr
  - Nitrobenzene stripper tails, 10 ppm, 1.9 Mg/yr
- g. Plant G is a petrochemical plant that reported 27 Mg/yr.
- Wash water, 947 ppm, 9.8 Mg/yr
  - Caustic sump, 587 ppm, 4.9 Mg/yr
  - Dispersed oil extraction blowdown, 558 ppm, 3.9 Mg/yr
  - Fuel oil tank blowdown, 30,000 ppm (3%), 3.2 Mg/yr
  - Saturator blowdown, 77 ppm, 2 Mg/yr

- Fuel oil stripper separator, 790 ppm, 1.5 Mg/yr
  - Quench water blowdown, 410 ppm, 1 Mg/yr
- h. Plant H produces ethylene, propylene, and other hydrocarbon products and reported a TAB of 61 Mg/yr. Waste streams with benzene included quench water, dilution steam, spent caustic solution, caustic scrubber wash water, and storage tank drawdown. No details were given.

Example 12 is a report that requires additional information for several reasons. First, it is barely below the 10 Mg/yr threshold at 9.5 Mg/yr. However, we can not be sure that all of their wastes were reported or that benzene was not lost in the collection system because they reported the combined wastewater entering the wastewater treatment facility. A typical facility can lose 20 to 40 percent of the benzene in the collection system prior to wastewater treatment. The range of concentrations are all below 10 ppm; however, we do not know if individual streams exceed 10 ppm at the point of generation. Note also that the series of measurements ranged from 0.7 to 18 Mg/yr of TAB. More sampling at the point of generation may be a reasonable request to make for this facility.

#### 4.2 Check for Concentrations Reported for After Treatment

A particularly difficult situation to assess for the chemical plants is the degree of waste treatment that is performed and not reported. Many of these facilities have treated waste streams to recover organics (commonly by a simple physical separation or distillation) for some time because of economic incentives. These facilities may believe that the waste treatment is actually part of their process, and consequently, failed to report the wastes or to include them in their calculation of TAB.

Example 13 is a chemical plant that listed "wastewater stripper bottoms". The stripper feed should have been listed instead of the treated waste. For this case, the benzene quantity could be significant because of the large waste quantity that is stripped. For Example 14, the process is not as clear. If the strippers are part of the production process, then the wastes are generated by the stripper. However, if the strippers are treating wastes, the benzene content should be reported for the stripper feed. Example 15 is a plant that has already installed controls to treat process wastewater. However, the benzene in the wastes that are being treated should be reported based on the concentration before treatment. The numbers reported for TAB suggest that the benzene in the treated waste was used. More information should be requested. Example 16 is a plant that produces vinyl chloride monomer, and the wastewater is

steam stripped. However, this facility reported the benzene in the wastewater after treatment (i.e., "bottoms").

#### 4.3 Check for Organic Wastes that Enter the Sewer

As discussed for petroleum refineries, a point of confusion for some facilities is related to organic wastes that enter the sewer system. Some facilities have not included the benzene in organic wastes that enter the sewer in the calculation of TAB because the waste contains less than 10 percent water. However, after the organic waste is mixed with wastewater, it becomes an aqueous waste and all of the benzene in this wastewater must be included in the calculation of TAB. Organic wastes can enter the sewer from line drainings, poor separations, spills, pump leaks, etc.

Example 17 may be a facility that did not include organic wastes in the TAB. It is not clear that the organic waste with 19 percent benzene does not enter the sewer or that it is not recovered from a two phase waste. More information from the facility could clarify that this waste did not originate from a mixture with water or that it does not enter the wastewater system.

#### 4.4 Check to Determine that the Proper Wastes are Identified for Control

For facilities with a TAB of 10 Mg/yr or more, check to determine if the proper waste streams have been identified for control. Note particularly that organic wastes and sludges with 10 ppm or more benzene are listed for control. Is it clear why certain wastes are listed as not requiring control? For example, is the concentration less than 10 ppm, or does the waste qualify for the small quantity exemption of 2 Mg/yr or the low flow exemption for process wastewater (less than 10 Mg/yr or 0.02 L/min)?

Example 18 is an illustration of which wastes are to be controlled. The "cracking area exchanger cleaning" is not controlled because the concentration is less than 10 ppm. The "quench area process drainage" is not listed for control, probably because the facility claims that it is process wastewater with an annual waste quantity that is less than 10 Mg/yr (0.38 Mg/yr). However, it is not clear that this drainage qualifies as process wastewater, and additional information from the facility may be needed to clarify this point. Example 19 shows "spent caustic" at 5 ppm as being controlled; however, it is not clear why controls would be required.



## COKE BY-PRODUCT PLANTS

### 5. GUIDANCE FOR COKE BY-PRODUCT RECOVERY PLANTS

A checklist is provided below for the review of reports from coke by-product recovery plants. The following sections provide additional details for each item.

1. Compare the reported TAB to the facility's coke capacity.
2. Compare the reported waste streams to the list of wastes expected. Check the benzene quantity and concentration for reasonableness.
3. Check for benzene concentrations that may have been reported for the waste after it has been treated for benzene removal.
4. Check to determine if the proper waste streams have been identified for control.

#### 5.1 Coke Capacity and Reported TAB

Table 2 lists the coke capacity of the by-product coke plants currently in operation (5/91). The top 10 to 30 percent of the plants with respect to capacity are expected to exceed a TAB of 10 Mg/yr.

#### 5.2 Check for Major Waste Streams

Three major waste streams that contain benzene were identified for coke by-product recovery plants. Waste ammonia liquor is produced from gas cooling operations (direct contact) and contains benzene at concentrations that may range from 3 to 180 ppm. The waste ammonia liquor is usually stripped, and the vapors containing ammonia and volatile organics such as benzene are added back to the coke oven gas. If the ammonia liquor storage tanks are controlled under the benzene NESHAP for by-product plants, benzene determinations for the 90-day report are based on the effluent from the ammonia stripper. Benzene concentrations after stripping should be well below 10 ppm, and this stream would not contribute significantly to the TAB. (The benzene concentration in the water after stripping was reported as 0.6 ppm by one plant.) A few coke plants send part or all of their ammonia liquor to wastewater treatment. For these facilities, it is important that the benzene determinations be made as close as possible to the point of generation before benzene is lost in the collection system or open wastewater tanks.

Most of these plants recover light oil, which is a mixture of benzene, toluene, and xylene. The recovery process generates wastewater that contains benzene from condensed steam and oil-water decanters. The two major wastes are water from the light oil condenser and water from the wash oil decanter (wash oil is used to scrub BTX from the gas). These wastes are reported to contain benzene at concentrations of 18 to 97 ppm. Benzene determinations are made after the last unit that is controlled by the by-product plant NESHAP. At some plants, this unit would likely be the light-oil sump, which collects wastewater from the light-oil process, separates any oil floating on top for reuse, and discharges the water to wastewater treatment. In this case, benzene determinations of quantity and concentration are made on the water layer leaving the controlled sump.

Several miscellaneous wastes have been reported for coke plants, such as condensate from coke gas lines (49 ppm; range of 0 to 73 ppm), water blowdown (16 to 38 ppm), and scrubber drip-leg water (31 ppm). All coke plants produce tar decanter sludge with an expected benzene concentration of 10 to 100+ ppm. Some facilities may "forget" to report this sludge because it is recycled back to the coke ovens. However, most of the methods used to store or transport this sludge provide several opportunities for the benzene to evaporate.

### 5.3 Check for Concentrations Reported for After Treatment

Coke plants generally use a steam stripper to remove ammonia from wastewater. However, if the ammonia liquor storage tanks and other sources up to the stripper are controlled by the NESHAP for coke by-product recovery plants (Subpart L), then the benzene concentration is determined from the wastewater that leaves the stripper.

*Example 20 is the report from a relatively small coke plant with a capacity of 477,000 Mg/yr. Note that the benzene concentration in the water after stripping was only 0.6 ppm.*

### 5.4 Check to Determine that the Proper Wastes are Identified for Control

For facilities with a TAB of 10 Mg/yr or more, check to determine if the proper waste streams have been identified for control. Note particularly that organic wastes and sludges with 10 ppm or more benzene are listed for control. Is it clear why certain wastes are listed as not requiring control? For example, is the concentration less than 10 ppm, or does the waste qualify for the low quantity exemption for process wastewater (less than 10 Mg/yr or 0.02 L/min)?

## TSDF

### 6. WASTE MANAGEMENT FACILITIES

Facilities that manage wastes and have a permit under Subtitle C of RCRA are required to submit a report if they handle benzene wastes from any of the three affected industries. A partial listing of these treatment, storage, and disposal facilities (TSDF) that have benzene in their wastes is given in Table 2. The most common wastes that contain benzene at these facilities appear to be sludges from the petroleum refining industry.

Most of these facilities are not expected to exceed the 10 Mg/yr cutoffs unless they manage relatively large quantities of wastewater containing benzene. It is important to note that only hazardous wastes, as determined under RCRA in 40 CFR 261, from chemical manufacturing plants, coke by-product recovery plants, and petroleum refineries, that contain benzene are counted in the TSDF's TAB determination. However, if a TSDF's TAB is 10 Mg/yr or greater then all benzene-containing wastes from the affected industries are subject to the control and treatment provisions of the rule. In addition, if these facilities receive a waste from any of the three industries that has been identified as requiring control (as determined at the generator), the waste must be controlled at the offsite facility, even if the offsite facility does not exceed a TAB of 10 Mg/yr.

## PRIORITIES

### 7. SETTING PRIORITIES FOR FOLLOW-UP ACTIVITIES

After the review of the reports and recording the findings on the status sheet, determine priorities for requesting additional information for specific facilities. One approach at setting priorities for follow-up activities is provided below. However, the Regional Offices may establish other priorities based on a knowledge of facilities located in their region.

- Facilities with significant capacities that have not filed a report.
- Facilities that have reported a TAB of less than 10 Mg/yr, but are suspect because of their capacity, wastes not being listed, or unusually low benzene concentrations or quantities.
- Facilities that have reported a TAB of 10 Mg/yr or more, but are suspect because of the wastes that are identified as remaining uncontrolled, wastes that are not reported, unusually low concentrations, etc.

(Note: For facilities with a TAB >10 Mg/yr, regions may elect to delay follow-up actions until the facility confirms that it is complying with the control and treatment requirements of the rule and is not operating under a compliance waiver. Also, when reviewing a facility's compliance status priority should be given to checking waste streams identified as exempt from the control and treatment requirements to ensure that the exemptions are in accordance with the rule. On the other hand, characterization of waste streams that are managed in controlled units is not critical and therefore should be given a low priority).

ATTACHMENTS: TABLES 1, 2, AND 3 AND FIGURE 1



TABLE 1. EXAMPLE STATUS SHEET: FACILITIES REPORTING FOR THE BENZENE WASTE NESHAP

Plant Name	Location	Industry	Report Date	Review Date	Findings	Priority*
ABC Refining	Gulfport, MS	Petroleum	05/02/90	05/20/90	Small refinery; less than 10 Mg/yr	low
Big Oil	Ashland, KY	Petroleum	05/30/90	06/07/90	Medium size refinery; 9.5 Mg/yr low quantity from desalting	high
Acme Chemical	Columbia, SC	Chemical	05/31/90	06/07/90	5 Mg/yr; concentrations appear to be after treatment	high
New Steel	Atlanta, GA	Coke	06/02/90	06/09/90	Small coke plant; less than 1 Mg/yr	low
Company Z	Raleigh, NC	Petroleum	06/05/90	06/15/90	Large refinery; over 10 Mg/yr; organic wastes not identified for control	medium
Small Chemical	Knoxville, TN	Chemical	06/05/90	06/15/90	No benzene	low
Benz-Chem	Miami, FL	Chemical	06/10/90	06/20/90	8 Mg/yr; incomplete reporting of quantity and concentration	high
Bigger Oil	Tarrant, AL	Petroleum	06/11/90	06/25/90	20 Mg/yr; incomplete reporting of quantity and concentration	medium

\*Priority for requesting additional information from the company.





STATUS SHEET: FACILITIES REPORTING FOR THE BENZENE WASTE NESHAP

Plant Name	Location	Industry	Report Date	Review Date	Findings	Priority
------------	----------	----------	-------------	-------------	----------	----------

TABLE 2. LIST OF PETROLEUM REFINERIES (updated 1992)

No.	PLANT	CRUDE OIL			CITY	CRUDE OIL			PLANT	CITY	CRUDE OIL		
		STATE	1,000 BBL/DAY	No.		STATE	1,000 BBL/DAY	No.			STATE	1,000 BBL/DAY	No.
1	ARCO ALASKA	AK	17.5	39	PRUDHOE BAY	AK	17.5	39	TEXACO	WILMINGTON	CA	95.0	
2	ARCO ALASKA	AK	12.0	40	KUPARUK	AK	12.0	40	TOSCO CORP.	MARTINEZ	CA	132.0	
3	MAPOCO PETROLEUM	AK	115.0	41	NORTH POLE	AK	115.0	41	ULTRAMAR	WILMINGTON	CA	68.0	
4	PETRO STAR	AK	8.0	42	NORTH POLE	AK	8.0	42	UNION OIL OF CALIFOR	SAN FRANCISCO	CA	113.0	
5	TESORO	AK	72.0	43	KENAI	AK	72.0	43	UNOCAL	LOS ANGELES	CA	108.0	
6	COASTAL MOBILE	AL	14.3	44	MOBILE BAY	AL	14.3	44	WITCO	OILDALE	CA	10.3	
7	GAMXX ENERGY	AL	26.5	45	THEODORE	AL	26.5	45	COLORADO REF.	COMMERCE CI	CO	28.0	
8	HUNT REFINING	AL	33.5	46	TUSCALOOSA	AL	33.5	46	CONOCO	DENVER	CO	48.0	
9	LOUISIANA LAND & EXP	AL	80.0	47	SARALAND	AL	80.0	47	LANDMARK	FRUITA	CO	15.2	
10	BERRY PETROLEUM	AR	5.7	48	STEVENS	AR	5.7	48	STAR REF.	DELAWARE CIT	DE	140.0	
11	CROSS	AR	6.8	49	SMACKOVER	AR	6.8	49	AMOCO	SAVANNAH	GA	28.0	
12	LION OIL	AR	48.0	50	EL DORADO	AR	48.0	50	YOUNG REF.	DOUGLASVILLE	GA	7.5	
13	INTERMOUNTAIN REF.	AZ	5.7	51	FREDONIA	AZ	5.7	51	CHEVRON	BARBER'S PT	HI	52.8	
14	SUNBELT	AZ	8.5	52	RANDOLPH	AZ	8.5	52	HAWAII INDEP. REF.	EWA BEACH	HI	90.3	
15	ANCHOR REF.	CA	10.0	53	MCKITTRICK	CA	10.0	53	CLARK OIL & REFINING	HARTFORD	IL	57.0	
16	ATLANTIC RICHFIELD	CA	223.0	54	CARSON	CA	223.0	54	CLARK OIL & REFINING	BLUE ISLAND	IL	66.5	
17	CHEMOIL	CA	14.2	55	SIGNAL HILL	CA	14.2	55	INDIAN REFINING	LAWRENCEVILLE	IL	54.0	
18	CHEVRON	CA	205.0	56	RICHMOND	CA	205.0	56	MARATHON PETROLEUM	ROBINSON	IL	170.0	
19	CHEVRON	CA	254.0	57	EL SEGUNDO	CA	254.0	57	MOBIL	JOULET	IL	180.0	
20	CONOCO	CA	9.5	58	SANTA MARIA	CA	9.5	58	SHELL	WOOD RIVER	IL	274.0	
21	EDGINGTON OIL COMPANY	CA	41.6	59	LONG BEACH	CA	41.6	59	UNO-VEN	LEWIS	IL	147.0	
22	EXXON	CA	128.0	60	BENICIA	CA	128.0	60	AMOCO	WHITING	IN	350.0	
23	FLETCHER OIL & REFIN	CA	29.7	61	CARSON	CA	29.7	61	COUNTRYMARK	MT. VERNON	IN	20.6	
24	GOLDEN WEST REFINING	CA	44.0	62	SANTA FE SPRING	CA	44.0	62	LAKETON REFINING	LAKETON	IN	8.3	
25	HUNTWAY REF.	CA	5.5	63	WILMINGTON	CA	5.5	63	MARATHON	INDIANAPOLIS	IN	50.0	
26	HUNTWAY REF.	CA	8.4	64	BENICIA	CA	8.4	64	COASTAL	WICHITA	KS	29.9	
27	KERN OIL & REFINING	CA	20.0	65	BAKERSFIELD	CA	20.0	65	COASTAL	EL DORADO	KS	30.4	
28	LUNDAY-THAGARD CO.	CA	7.0	66	SOUTH GATE	CA	7.0	66	FARMLAND INDUSTRIES	COFFEYVILLE	KS	59.6	
29	MOBIL	CA	123.0	67	TORRANCE	CA	123.0	67	FARMLAND INDUSTRIES	PHILLIPSBURG	KS	26.4	
30	PACIFIC REF.	CA	52.3	68	HERCULES	CA	52.3	68	NATIONAL COOPERATIVE	MCPHERSON	KS	70.9	
31	PARAMOUNT PET.	CA	42.7	69	PARAMOUNT	CA	42.7	69	TEXACO	EL DORADO	KS	80.0	
32	POWERINE OIL	CA	46.5	70	SANTA FE SPRING	CA	46.5	70	TOTAL PETROLEUM	ARKANSAS CIT	KS	56.0	
33	SAN JOAQUIN REF.	CA	18.0	71	BAKERSFIELD	CA	18.0	71	ASHLAND	CATLETTSBURG	KY	213.4	
34	SHELL	CA	133.0	72	WILMINGTON	CA	133.0	72	SOMERSET REFINERY	SOMERSET	KY	5.5	
35	SHELL	CA	140.0	73	MARTINEZ	CA	140.0	73	AMERICAN INTL	LAKE CHARLES	LA	28.5	
36	SUNLAND REF.	CA	15.0	74	BAKERSFIELD	CA	15.0	74	ATLAS	SHREVEPORT	LA	46.2	
37	TEN BY	CA	4.3	75	OXNARD	CA	4.3	75	BP OIL	BELLE CHASSE	LA	219.0	
38	TEXACO	CA	49.4	76	BAKERSFIELD	CA	49.4	76	CALCASIEU REFINING	LAKE CHARLES	LA	13.5	

TABLE 2. LIST OF PETROLEUM REFINERIES (updated 1992)

CRUDE OIL					CRUDE OIL				
No.	PLANT	CITY	STATE	1,000 BBL/DAY	No.	PLANT	CITY	STATE	1,000 BBL/DAY
77	CALUMET REFINING COM	PRINCETON	LA	4.4	115	GIANT REFINERY	GALLUP	NM	20.0
78	CANAL REF.	CHURCH POINT	LA	9.9	116	NAVAJO REFINING	ARTESIA	NM	38.0
79	CAS	MERMENTAU	LA	15.0	117	THRIFTWAY	FARMINGTON	NM	2.5
80	CITGO PETROLEUM	LAKE CHARLES	LA	320.0	118	PETRO SOURCE	TONOPAH	NV	4.5
81	CONOCO	LAKE CHARLES	LA	160.0	119	CIBRO PETROLEUM	ALBANY	NY	39.9
82	EXXON	BATON ROUGE	LA	421.0	120	ASHLAND	CANTON	OH	66.0
83	KERR MCGEE	COTTON VALLE	LA	7.8	121	BP	LIMA	OH	143.0
84	MARATHON PETROLEUM	GARYVILLE	LA	225.0	122	BP	TOLEDO	OH	121.0
85	MOBIL	CHALMETTE	LA	160.0	123	SUN CO.	TOLEDO	OH	125.0
86	MURPHY OIL CORPORATI	MERAUX	LA	97.0	124	BARRETT REF.	THOMAS	OK	11.0
87	PHIBRO	KROTZ SPRING	LA	56.7	125	CONOCO	PONCA CITY	OK	140.0
88	PHIBRO	ST. ROSE	LA	28.3	126	CYRIL PETROCHEM	CYRIL	OK	12.5
89	PLACID REFINING	PORT ALLEN	LA	48.0	127	KERR MCGEE	WYNNEWOOD	OK	43.0
90	SHELL	NORCO	LA	215.0	128	SINCLAIR OIL	TULSA	OK	50.0
91	STAR REF.	CONVENT	LA	225.0	129	SUN CO.	TULSA	OK	85.0
92	CRYSTAL REF.	CARSON CITY	MI	4.0	130	TOTAL PETROLEUM	AFDAMORE	OK	68.0
93	LAKESIDE REF.	KALAMAZOO	MI	5.6	131	CHEVRON	PORTLAND	OR	16.0
94	MARATHON PETROLEUM	DETROIT	MI	70.0	132	BP OIL	MARCUS HOOK	PA	171.0
95	TOTAL PETROLEUM	ALMA	MI	45.6	133	CHEVRON	PHILADELPHIA	PA	175.0
96	ASHLAND	ST. PAUL PARK	MN	67.1	134	PENNZOIL	ROUSEVILLE	PA	15.7
97	KOCH REFINING	ROSEMOUNT	MN	218.5	135	SUN	PHILADELPHIA	PA	130.0
98	AMERADA HESS	PURVIS	MS	30.0	136	SUN CO.	MARCUS HOOK	PA	175.0
99	CHEVRON	PASCAGOULA	MS	295.0	137	UNITED REF.	WARREN	PA	64.6
100	ERGON REF.	VICKSBURG	MS	16.8	138	WITCO	BRADFORD	PA	10.0
101	SOUTHLAND OIL	SANDERSVILLE	MS	11.0	139	MAPOO PETROLEUM	MEMPHIS	TN	75.0
102	SOUTHLAND OIL	LUMBERTON	MS	5.8	140	AMOCO	TEXAS CITY	TX	433.0
103	CENEX REF.	LAUREL	MT	40.4	141	CHEVRON	PORT ARTHUR	TX	315.0
104	CONOCO	BILLINGS	MT	49.5	142	CHEVRON	EL PASO	TX	66.0
105	EXXON	BILLINGS	MT	42.0	143	CITGO	CORPUS CHRI	TX	133.0
106	MONTANA REFINING COM	GREAT FALLS	MT	7.0	144	COASTAL REFINING	CORPUS CHRI	TX	90.3
107	AMOCO	MANDAN	ND	58.0	145	CROWN CENTRAL	HOUSTON	TX	100.0
108	AMERADA-HESS	PORT READING	NJ	0.0	146	DIAMOND SHAMROCK	SUNRAY	TX	111.0
109	CHEVRON	PERTH AMBOY	NJ	80.0	147	DIAMOND SHAMROCK	THREE RIVERS	TX	53.0
110	COASTAL EAGLE PT.	WESTVILLE	NJ	109.3	148	EL PASO REFINING	EL PASO	TX	52.0
111	EXXON	LINDEN	NJ	130.0	149	EXXON	BAYTOWN	TX	396.0
112	MOBIL	PAULSBORO	NJ	100.0	150	FINA OIL	PORT ARTHUR	TX	110.0
113	SEAVIEW	THOROFARE	NJ	80.0	151	FINA OIL	BIG SPRING	TX	55.0
114	BLOOMFIELD REFINING	BLOOMFIELD	NM	16.1	152	HOWELL HYDROCARBONS	SAN ANTONIO	TX	1.9

TABLE 2. LIST OF PETROLEUM REFINERIES (updated 1992)

No.	PLANT	CITY	CRUDE OIL		No.	PLANT	CITY	STATE	CRUDE OIL	
				1,000 BBL/DAY						1,000 BBL/DAY
153	KOCH REFINING	CORPUS CHRI	TX	125.0	173	CHEVRON	SALT LAKE CIT	UT		45.0
154	LA GLORIA OIL AND GA	TYLER	TX	49.5	174	CRYSEN REFINING	WOODS CROS	UT		12.5
155	LEAL	NIXON	TX	12.0	175	PENNZOIL	ROOSEVELT	UT		8.0
156	LIQUID ENERGY CORP.	BRIDGEPORT	TX	10.0	176	PHILLIPS	WOODS CROS	UT		25.0
157	LYONDELL PETROCHEMIC	HOUSTON	TX	265.0	177	AMOCO	YORKTOWN	VA		53.0
158	MARATHON PETROLEUM	TEXAS CITY	TX	70.0	178	ARCO PETROLEUM	FERNDAL	WA		167.0
159	MOBIL	BEAUMONT	TX	275.0	179	BP	FERNDAL	WA		90.3
160	PHIBRO	HOUSTON	TX	67.0	180	CHEVRON	SEATTLE	WA		0.0
161	PHIBRO	TEXAS CITY	TX	124.0	181	SHELL	ANACORTES	WA		89.0
162	PHILLIPS	SWEENEY	TX	175.0	182	SOUND REF.	TACOMA	WA		11.9
163	PHILLIPS	BORGER	TX	105.0	183	TEXACO	ANACORTES	WA		132.0
164	PRIDE REFINING	ABILENE	TX	45.5	184	U.S. OIL & REFINING	TACOMA	WA		32.8
165	SHELL	ODESSA	TX	28.6	185	MURPHY OIL CORPORATI	SUPERIOR	WI		32.0
166	SHELL	DEER PARK	TX	216.0	186	PHOENIX	ST. MARYS	WV		19.2
167	SOUTHWESTERN REFININ	CORPUS CHRI	TX	104.0	187	QUAKER STATE OIL REF	NEWELL	WV		10.5
168	STAR REF.	PORT ARTHUR	TX	250.0	188	FRONTIER OIL	CHEYENNE	WY		35.0
169	TRIFINERY	CORPUS CHRI	TX	18.0	189	LITTLE AMERICA REF.	CASPER	WY		22.0
170	VALERO ENERGY CORP.	CORPUS CHRI	TX	27.0	190	SINCLAIR OIL	SINCLAIR	WY		54.0
171	AMOCO	SALT LAKE CIT	UT	40.0	191	WYOMING REF.	NEWCASTLE	WY		11.9
172	BIG WEST OIL	SALT LAKE CIT	UT	24.0						

TABLE 2. LIST OF CHEMICAL PLANTS

No.	PLANT	CITY	STATE	No.	PLANT	CITY	STATE
1	ALLIED SIGNAL	BIRMINGHAM	AL	39	RUBICON CHEMICALS IN	GEISMAR	LA
2	MONSANTO CO	ANNISTON	AL	40	STAUFFER CHEMICAL	BATON ROUGE	LA
3	GREAT LAKES CHEMICAL	EL DORADO	AR	41	UNION CARBIDE CORP.	HAHNVILLE	LA
4	ALPHA RESINS	PERRIS	CA	42	VISTA CHEMICAL	WESTLAKE	LA
5	DOW CHEMICAL	PITTSBURG	CA	43	CIBA CORNING	MEDFIELD	MA
6	LILLY COATINGS	MONTEBELLO	CA	44	PMC CORP.	BALTIMORE	MD
7	Witco Corp.	OILDALE	CA	45	VISTA CHEMICAL	BALTIMORE	MD
8	DOW CHEMICAL	LEDYARD	CT	46	DOW CORNING	MIDLAND	MI
9	UPJOHN CO., THE	NORTH HAVEN	CT	47	PARKE-DAVIS	HOLLAND	MI
10	STANDARD CHLORIDE CH	DELAWARE CT	DE	48	3-M COMPANY	COTTAGE GRO	MN
11	ALPHA CHEMICAL	LAKELAND	FL	49	AMERICAN CYANAMID CO	HANNIBAL	MO
12	OLIN CORP.	ST. MARKS	FL	50	MONSANTO CO	ST. LOUIS	MO
13	ATLANTIC WOOD INDUST	SAVANNAH	GA	51	FIRST CHEMICAL CORP	PASCAGOULA	MS
14	DOW CHEMICAL	DALTON	GA	52	KERR-MCGEE CHEM. COR	MERIDIAN	MS
15	DSM CHEMICALS	AUGUSTA	GA	53	REICHHOLD CHEMICALS	GULFPORT	MS
16	NIPRO, INC.	AUGUSTA	GA	54	MALLINCKRODT CHEM.	RALEIGH	NC
17	OLIN CHEMICALS	AUGUSTA	GA	55	AMERICAN CYANAMID	BRIDGEWATER	NJ
18	NORCHEM CO.	CLINTON	IA	56	AMERICAN CYANAMID CO	LUNDEN	NJ
19	CLARK OIL & REFINING	BLUE ISLAND	IL	57	ATLANTIC WOOD INDUST	HAINESPORT	NJ
20	GOODRICH, (B.F.)	HENRY	IL	58	BASF WYANDOTTE CORP.	JAMESBURG	NJ
21	MONSANTO CO	SAUGET	IL	59	CIBA-GEIGY	TOMS RIVER	NJ
22	NORCHEM, INC.	MORRIS	IL	60	COOSAN CHEMICAL	CARLSTADT	NJ
23	REILLY TAR AND CHEMI	GRANITE CITY	IL	61	DUPONT	GIBBSTOWN	NJ
24	STEPAN CO.	ELWOOD	IL	62	DUPONT	DEEPWATER	NJ
25	US INDUSTRIAL CHEM.	TUSCOLA	IL	63	HERCULES	GIBBSTOWN	NJ
26	MEAD JOHNSON	EVANSVILLE	IN	64	INT'L FLAVORS & FRAG	UNION BEACH	NJ
27	REILLY TAR AND CHEMI	INDIANAPOLIS	IN	65	MARISOL INC.	MIDDLESEX	NJ
28	ABBOTT LABORATORIES	WICHITA	KS	66	MOBAY CORP.	HALEDON	NJ
29	AIR PRODUCTS & CHEM.	WICHITA	KS	67	MONSANTO CO	BRIDGEPORT	NJ
30	VULCAN MATERIALS	WICHITA	KS	68	ORBIS PRODUCTS CORP	NEWARK	NJ
31	BF GOODRICH CHEMICAL	CALVERT CITY	KY	69	ORTHO DIAGNOSTICS	RARITAN	NJ
32	DEVDE & RAYNOLDS	LOUISVILLE	KY	70	REICHHOLD CHEMICALS	ELIZABETH	NJ
33	GAF CORP.	CALVERT CITY	KY	71	SOUTHLAND CORP.	GREAT MEADO	NJ
34	TREMCO INC.	BARBOURVILL	KY	72	STAUFFER CHEMICAL CO	EDISON	NJ
35	USS CHEMICALS	FLORENCE	KY	73	TROY CHEMICAL CORP.	NEWARK	NJ
36	DOW CHEMICAL	PLAQUEMAN	LA	74	MONTROSE CHEMICAL CO	HENDERSON	NV
37	ETHYL CORP.	BATON ROUGE	LA	75	AYERST LABS	ROUSES POINT	NY
38	GEORGIA-PACIFIC CORP	PLAQUEMINE	LA	76	EASTMAN KODAK	ROCHESTER	NY

TABLE 2. LIST OF CHEMICAL PLANTS

No.	PLANT	CITY	STATE	No.	PLANT	CITY	STATE
77	GENERAL ELECTRIC	WATERFORD	NY	114	GOODYEAR TIRE	BEAUMONT	TX
78	NEPERA CHEMICAL CO.,	HARRIMAN	NY	115	GOODYEAR TIRE & RUBB	LAPORTE	TX
79	ALLIED CHEMICAL	IRONTON	OH	116	HEAT ENERGY TECH.	DALLAS	TX
80	ARIS TECH CHEMICAL	HAVERHILL	OH	117	KOCH INDUSTRIES	CORPUS CHRI	TX
81	BF GOODRICH	AVON LAKE	OH	118	KOPPERS	HOUSTON	TX
82	MONSANTO CO	ADDYSTON	OH	119	LILLY IND. COATINGS	DALLAS	TX
83	PPG INDUSTRIES	NORTON	OH	120	MOBIL CHEMICALS	BEAUMONT	TX
84	PPG INDUSTRIES	DELAWARE	OH	121	MONSANTO CO	ALVIN	TX
85	USS CHEMICAL	IRONTON	OH	122	S.D.S. BIOTECH CORP.	HOUSTON	TX
86	AMCHEM PRODUCTS INC.	AMBLER	PA	123	UNION CARBIDE	SEADRIFT	TX
87	ATLANTIC RICHFIELD C	MONACA	PA	124	UNION CARBIDE CORP	TEXAS CITY	TX
88	CALGON CARBON	NEVILLE ISLAN	PA	125	UPJOHN CO	LA PORTE	TX
89	KOPPERS CO INC	BRIDGEVILLE	PA	126	WITCO CHEMICAL CORPO	POINT COMFO	TX
90	MINE SAFETY APPL	EVANS CITY	PA	127	BROWNING MANUF.	MORGAN	UT
91	UNION CARBIDE	PENUELAS	PR	128	HERCULES	MAGNA	UT
92	UNION CARBIDE CARIBE	PONCE	PR	129	ATLANTIC WOOD INDUST	PORTSMOUTH	VA
93	DUPONT	LUGOFF	SC	130	ALDRICH CHEMICALS	MILWAUKEE	WI
94	CHATTAM CHEMICALS	CHATTANOOG	TN	131	E.I. DUPONT	PARKERSBUR	WV
95	RHONE-POULENC INC.	MT. PLEASANT	TN	132	MOBAY CHEMICAL CORP	NEW MARTINS	WV
96	US ARMY MUNITIONS	KINGSTON	TN				
97	AMERICAN HOECHST COR	PASADENA	TX				
98	AMERICAN HOECHST COR	HOUSTON	TX				
99	AMOCO CHEMICAL	TEXAS CITY	TX				
100	ATLANTIC RICHFIELD	HOUSTON	TX				
101	CAIN CHEMICAL	BRAZORIA	TX				
102	CELANESE CHEMICAL	BISHOP	TX				
103	CELANESE CORP.	PAMPA	TX				
104	COSDEN OIL & CHEMICA	BIG SPRING	TX				
105	DENKA CHEMICAL CO.	HOUSTON	TX				
106	DIAMOND SHAMROCK COR	DEER PARK	TX				
107	DOW CHEMICAL USA	FREERPORT	TX				
108	DUPONT	BEAUMONT	TX				
109	E I DUPONT DE NEMOUR	ORANGE	TX				
110	EASTMAN KODAK INC.	LONGVIEW	TX				
111	GEORGIA GULF CORP.	PASADENA	TX				
112	GEORGIA-PACIFIC CORP	PASADENA	TX				
113	GUDDEN COATINGS	CARROLLTON	TX				

TABLE 2. LIST OF TREATMENT, STORAGE, AND DISPOSAL FACILITIES

No.	PLANT	CITY	STATE	No.	PLANT	CITY	STATE
1	CHEM. WASTE MGMT	EMELLE	AL	25	ROLLINS ENV. SERVICE	BRIDGEPORT	NJ
2	ENSCO	EL DORADO	AR	26	SOLVENT RECOV. SERVI	LINDEN	NJ
3	CASMALJA RESOURCES	CASMALJA	CA	27	CALLEJA RES. RECOVER	BROOKLYN	NY
4	IT CORPORATION	BENECIA	CA	28	CECOS INT'L	NIAGRA FALLS	NY
5	IT CORPORATION	WESTMORELA	CA	29	FRONTIER CHEMICAL	NIAGRA FALLS	NY
6	IT CORP.-PETROL WAS	BUTTONWILLO	CA	30	CECOS INT'L	CINCINNATI	OH
7	WASTE TECH SERVICES	GOLDEN	CO	31	CECOS INT'L	WILLIAMSBUR	OH
8	CECOS	STAMFORD	CT	32	CHEM-CLEAR INC.	CLEVELAND	OH
9	CECOS INT'L	BRISTOL	CT	33	ECOLOTEC	DAYTON	OH
10	ENV. WASTE RESOURCES	WATERBURY	CT	34	ENVIROSAFE SERVICES	OREGON	OH
11	CHEM. WASTE MGMT.	CALUMET CITY	IL	35	ENV. ENTERPRISES	CINCINNATI	OH
12	CID-LANDFILL	CALUMET CITY	IL	36	ERIEWAY POLL. CONTR	BEDFORD	OH
13	PEORIA DISPOSAL CO.	PEORIA	IL	37	CHEMICAL RESOURCES	TULSA	OK
14	HERITAGE ENV. SERVIC	INDIANAPOLIS	IN	38	DELAWARE CONTAINERS	COATSVILLE	PA
15	ASHLAND CHEMICAL	BOYD CO.	KY	39	INDUSTRIAL WASTE REM	LEWISBERRY	PA
16	CECOS INT'L	LIVINGSTON	LA	40	WASTE CONVERSION	HATFIELD	PA
17	HANSBROUGH ENERGY	CROWLEY	LA	41	GULF COAST WASTE DIS	TEXAS CITY	TX
18	COMMERCIAL DISPOSAL	WEST SPRINGF	MA	42	MALONE SERVICE CO.	TEXAS CITY	TX
19	CHEM-CLEAR INC.	BALTIMORE	MD	43	ROLLINS ENV. SERVICE	DEER PARK	TX
20	CHEM-MET SERVICES	WYANDOTTE	MI	44	TEXAS ECOLOGISTS	ROBSTOWN	TX
21	MICHIGAN DISPOSAL IN	BELLEVILLE	MI	45	PETROCHEM RECYCLING	SALT LAKE CIT	UT
22	TRICIL ENV. SERVICES	MUSKEGON HE	MI	46	RMT PROPERTIES	NORTH SALT L	UT
23	WAYNE DISPOSAL	BELLEVILLE	MI	47	USPCI GRASSY MT.	KNOWLES	UT
24	ROGERS LANDFILL	CENTREVILLE	MS	48	CHEMICAL PROCESSORS	SEATTLE	WA

TABLE 2. LIST OF COKE PLANTS (updated 1992)

No.	Plant	Coke 1,000 Mg/yr
1	ABC Coke, Tarrant, AL	636
2	Empire Coke, Holt, AL	147
3	Gulf States Steel, Gadsden, AL	536
4	Koppers, Woodward, AL	693
5	Sloss Industries, Birmingham, AL	389
6	Acme Steel, Chicago, IL	452
7	LTV Steel, Chicago, IL	558
8	National Steel, Granite City, IL	500
9	Bethlehem Steel, Burns Harbor, IN	1473
10	Citizens Gas, Indianapolis, IN	550
11	Inland Steel, East Chicago, IN	1341
12	USX, Gary, IN	1880
13	Armco Inc., Ashland, KY	833
14	National Steel, Ecorse, MI	795
15	Bethlehem Steel, Lackawanna, NY	680
16	Tonawanda, Buffalo, NY	250
17	Armco Inc., Middletown, OH	1248
18	LTV Steel, Cleveland, OH	496
19	LTV Steel, Warren, OH	447
20	New Boston, Portsmouth, OH	341
21	Toledo Coke, Toledo, OH	179
22	Bethlehem Steel, Bethlehem, PA	991
23	Erie Coke, Erie, PA	195
24	LTV Steel, Pittsburgh, PA	1472
25	Sharon Steel, Monessen, PA	317
26	Shenango, Pittsburgh, PA	452
27	USX, Clairton, PA	4030
28	Geneva Steel, Provo, UT	742
29	Wheeling-Pitt, East Steubenville, WV	1247



TABLE 3. COMPARISON OF TAB AND CAPACITY FOR PETROLEUM REFINERIES

Refinery Number	Tab (Mg/yr)	Capacity (1,000 bbl/d) <sup>a</sup>		Benzene from desalting		
		Crude Oil	Other Units <sup>b</sup>	Mg/yr	Average ppm	Range ppm
1	118	123	163			
2	63	51	51	2.0	13	
3	38	145	138	9.2	37	
4	33	75	114			
5	33	215	134	26.4	50	
6	32	157	120	24.6	45	
7	24	58	55	4.6	12	9 to 15
8	18	455	338	12.0	12	9 to 14
9	17	214	186			
10	12	140	128	11.0	19	12 to 32
11	11	195	220			
12	11	128	114	7.5	19	16 to 25
13	10	40	26	5.7	96	51 to 86
14	9	45	32			
15	8	46	10	2.7	16	7 to 24
16	6	47	35	0.7	3 <sup>c</sup>	3 to 4
17	6	55	41	4.4	22	
18	5	40	21	1.6	14	7 to 19
19	3 <sup>c</sup>	65	56	2.1	8	7 to 9
20	2	8	0			
21	2	12	0	1.9	53	25 to 55
22	1 <sup>c</sup>	42	47			
23	0.4 <sup>c</sup>	33	0	0.4	3 <sup>c</sup>	

<sup>a</sup>Barrels per day.<sup>b</sup>Other processes that produce benzene wastes (cat cracking and reforming, coking, visbreaking, naphtha sweetening, and benzene production).<sup>c</sup>Appears to be outside normal range for this parameter.

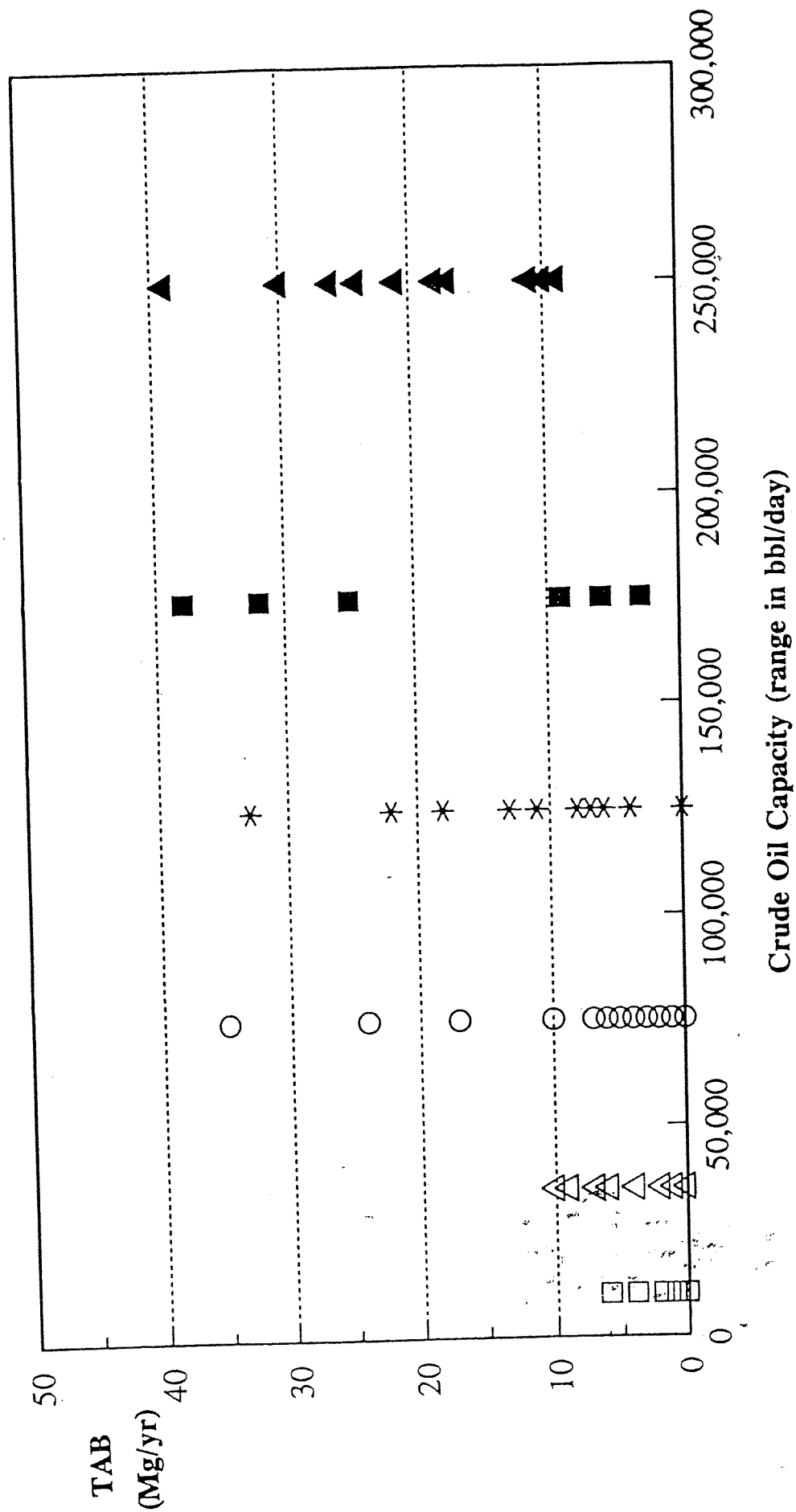


Figure 1. Reported TAB for 1990 for all Facilities Reporting TAB Less Than 50

ATTACHMENTS: EXAMPLES FOR 90-DAY REPORT GUIDANCE



[illegible]



BENZENE WASTE OPERATIONS WASTE STREAM REGULATORY STATUS

EXAMPLE 3

WASTEWATER

DESCRIPTION	BENZENE CONTROLS	ANNUAL WASTE QUANTITY (MMGAL/YR)	BENZENE CONCENTRATION (PPMV)	ANNUAL BENZENE QUANTITY (MG/YR)
FCCU WASTEWATER	YES	63	22	5.2
DCU WASTEWATER	YES	42	7	1.1
NORTH AREA PROCESS UNIT WASTEWATER	YES	42	30	4.8
NO. 6 SEPARATOR	NO	400	3	4.5
NO. 3 SEPARATOR	NO	395	3	4.5
SLOP WATER	YES	80	7	2.1
CRUDE UNIT WASTEWATER	YES	20	5	0.4
TANK WATER BOTTOMS	NO	7	50	1.3
BALLAST WATER	YES	7	7	0.2

TOTAL

24.1

TABLE 2  
BENZENE WASTE OPERATIONS WASTE STREAM REGULATORY STATUS

SLUDGES

DESCRIPTION	BENZENE CONTROLS	ANNUAL WASTE QUANTITY (MG/YR)	BENZENE CONCENTRATION (PPMW)	ANNUAL BENZENE QUANTITY (MG/YR)
TANK BOTTOM SLUDGES	NO	6200	13	8.1
WASTEWATER TREATMENT SLUDGE	NO	1660	3	0.6

TOTAL

8.7

# EXAMPLE 4

## WASTE STREAM REGULATORY STATUS

BENZE

Facility Name:

REFINERY

Prepared By:

Date: June 5, 1990  
Page 3 of 7

WASTE STREAM I.D.	BENZE CONTROLS (See Notes) Y N	WATER CONTENT <10% >10%	WASTE STREAM TYPE	ANNUAL WASTE QUANTITY (Mg/Yr)	BENZE FLOW WT. ANNUAL AVG (ppmw)	ANNUAL BENZENE QUANTITY (Mg/Yr)	STREAM INCL. IN TOTAL ? (Y or N)	NOTES
Crude Terminal Sewer	Y	Y	Proc. WW	90,300	7	0.6	Y	
Tk. 400 Water Draw	Y	Y	Tank Draw	15,365	54	0.8	Y	
Tk. 401 Water Draw	Y	Y	Tank Draw	15,365	54	0.8	Y	
Tk. 402 Water Draw	Y	Y	Tank Draw	15,365	54	0.8	Y	
Tk. 403 Water Draw	Y	Y	Tank Draw	15,365	54	0.8	Y	
Tk. 404 Water Draw	N	Y	Tank Draw	15,365	3	0.0	Y	
Tk. 405 Water Draw	N	Y	Tank Draw	15,365	3	0.0	Y	
Tk. 406 Water Draw	N	Y	Tank Draw	15,365	3	0.0	Y	
Tk. 407 Water Draw	TBD	Y	Tank Draw	15,365			N	TBD STREAM
Tk. 408 Water Draw	TBD	Y	Tank Draw	15,365			N	TBD STREAM
Tk. 409 Water Draw	TBD	Y	Tank Draw	15,365			N	TBD STREAM
Sour Water System	N	Y	Proc. WW	630,895	15	9.6	Y	Inj. Wells
#1 Coker Slop Oil	Y	Y	Other	7,697	500		N	<10% Water
Caustic Tk. Slop Oil	Y	Y	Other	2,431	500		N	<10% Water
#1 Crude Bar. Sump Slop	Y	Y	Other	7,157	500		N	<10% Water
#2 Crude Bar. Sump Slop	Y	Y	Other	1,215	500		N	<10% Water
Flare Drums Slop Oil	Y	Y	Other	13,098	500		N	<10% Water
Tk. 50 Slop Oil	Y	Y	Other	10,667	500		N	<10% Water
API Separator Outlet	TBD	Y	Other	4,075,367	4		N	Dbl. Acct.

Note a: Waste stream is treated and controlled for benzene emissions prior to and during treatment in accordance with 40 CFR 61 Subpart FF.

Note b: TBD (TO BE DETERMINED) - Major stream with uncertain regulatory status as of this report date.



## EXAMPLE 5

FACILITY:

Refinery PREPAR:

OF 2

WASTE STREAM IDENTIFICATION	BENZENE CONTROLS	WATER CONTENT	WASTE STREAM TYPE*	ANNUAL WASTE QUANTITY (Mg/yr)	BENZENE CONCENTRATION** (ppmw)	ANNUAL BENZENE QUANTITY (Mg/yr)
Equipment Description						
No. 2 CTU Desalter Undercarry	Yes	>10%	2	1.01E+06	40.0	7.64
No. 3 CTU Desalter Undercarry	Yes	>10%	2	3.77E+08	45.0	16.98
Combined SWS Feed to T-73	Yes	>10%	2	9.62E+05	7.1	6.83
Stripped Sour Water to ASU	No	>10%	2	2.28E+06	0.004	0.00
Coker Drill Water Blowdown	No	>10%	2	9.95E+04	0.8	0.06
T-42 - Heavy Stop	Yes	>10%	1	4.55E+02	25.0	0.01
T-43 - Heavy Stop	Yes	>10%	1	4.55E+02	25.0	0.01
T-25 - Regular Gasoline	Yes	>10%	1	6.36E+02	75.0	0.05
T-26 - Regular Gasoline	Yes	>10%	1	6.36E+02	75.0	0.05
T-80 - Regular Gasoline	Yes	>10%	1	6.36E+02	75.0	0.05
T-31 - Regular Unleaded Gasoline	Yes	>10%	1	9.09E+01	32.0	0.00
T-32 - Regular Unleaded Gasoline	Yes	>10%	1	9.09E+01	32.0	0.00
T-78 - Regular Unleaded Gasoline	Yes	>10%	1	9.09E+01	32.0	0.00
T-87 - Regular Unleaded Gasoline	Yes	>10%	1	9.09E+01	32.0	0.00
T-92 - Regular Unleaded Gasoline	Yes	>10%	1	9.09E+01	32.0	0.00
T-93 - Regular Unleaded Gasoline	Yes	>10%	1	9.09E+01	32.0	0.00
T-30 - Super Unleaded Gasoline	Yes	>10%	1	3.18E+02	75.0	0.02
T-64 - Super Unleaded Gasoline	Yes	>10%	1	3.18E+02	75.0	0.02
T-65 - Super Unleaded Gasoline	Yes	>10%	1	3.18E+02	75.0	0.02
T-77 - Super Unleaded Gasoline	Yes	>10%	1	3.18E+02	75.0	0.02
T-33 - Reformate	Yes	>10%	1	4.55E+02	160.0	0.07
T-79 - Reformate	Yes	>10%	1	4.55E+02	160.0	0.07
T-85 - Base FCC Gasoline	Yes	>10%	1	4.55E+02	37.0	0.02
T-89 - Naphtha	Yes	>10%	1	5.00E+01	51.0	0.00
T-68 - Naphtha	Yes	>10%	1	5.00E+01	51.0	0.00
T-86 - Naphtha	Yes	>10%	1	5.00E+01	51.0	0.00
T-88 - Naphtha	Yes	>10%	1	5.00E+01	51.0	0.00
T-193 - Naphtha	Yes	>10%	1	5.00E+01	51.0	0.00
T-345 - Naphtha	Yes	>10%	1	5.00E+01	51.0	0.00
T-344 - Light Straight Run	Yes	>10%	1	4.55E+02	110.0	0.05
T-346 - Sweet Crude	Yes	>10%	1	4.55E+02	8.7	0.00
T-347 - Sweet Crude	Yes	>10%	1	4.55E+02	8.7	0.00
T-371 - Sour Crude	No	>10%	1	4.55E+02	3.7	0.00
T-372 - Sour Crude	No	>10%	1	4.55E+02	3.7	0.00
T-373 - Sour Crude	No	>10%	1	4.55E+02	3.7	0.00
T-405 - Dock Ballast	Yes	>10%	1	4.55E+02	10.0	0.00
Phenolic Caustic	Yes	>10%	4	1.09E+03	27.0	0.03
Sulfidic Caustic	No	>10%	4	4.55E+03	2.1	0.01
Naphtha Tank Bottom Sludge	No	>10%	4	9.09E+01	3.7	0.00
Cooling Tower Sludge	No	>10%	4	4.09E+02	0.1	0.00
Slurry Oil Sludge	No	>10%	4	2.59E+03	7.1	0.02
Leaded Tank Bottoms	Yes	>10%	4	3.64E+00	100.0	0.00
Sour Gas Oil Sludge	No	>10%	4	0.00E+00	0.0	0.00
Sweet Crude Sludge	No	>10%	4	1.23E+03	6.8	0.01
Coke	No	>10%	4	1.82E+03	0.0	0.00
Coker Drill Water Top Draw	No	<10%	4	1.20E+05	1.0	0.12
Spent Sandblasting Grit	No	<10%	4	1.82E+00	0.1	0.00
Amine Filter Solids	No	<10%	4	3.64E+01	0.3	0.00
Activated Carbon	No	<10%	4	9.09E+01	na	na
HDS Catalyst	No	<10%	4	3.41E+02	0.3	0.00
Cat Poly Catalyst	No	<10%	4	3.18E+02	0.0	0.00
FCC Catalyst	No	<10%	4	1.36E+02	0.0	0.00

32.10

## \*WASTE STREAM TYPE

1. Product Tk. Drawdown
2. Process Wastewater
3. Landfill Leachate
4. Solid Waste

## \*\*BENZENE CONCENTRATION

At this time there is not sufficient waste stream data to provide a benzene concentration range.

## Notes:

1. Wastes with <10% water not counted in the total.

# EXAMPLE 3

## BENZENE WASTE OPERATIONS WASTE STREAM REGULATORY STATUS

FACILITY: Refinery PREPARED BY: DATE 5-31-90 PAGE: 2 OF 2

WASTE STREAM IDENTIFICATION Equipment Description	BENZENE CONTROLS	WATER CONTENT	WASTE STREAM TYPE*	ANNUAL WASTE QUANTITY (Mg/yr)	BENZENE CONCENTRATION** (ppmw)	ANNUAL BENZENE QUANTITY (Mg/yr)
Wastes Previously Counted:						
API Inlet Water	Yes	>10%	2	1.39E+08	22.0	30.68
API Float (Oil Sample)	Yes	>10%	4	5.59E+04	50.0	2.80
API Sludge	Yes	>10%	4	3.64E+02	150.0	0.05
Primary DAF Float	Yes	>10%	4	2.09E+04	190.0	3.97
ASU Float	No	>10%	4	2.27E+03	0.0	0.00
T-7 - Light Strip Oil	Yes	>10%	4	9.09E+02	10.0	0.01
T-8 - Light Strip Oil	Yes	>10%	4	9.09E+02	10.0	0.01
CPI Sludge	No	>10%	4	4.55E+02	120.0	0.05
Strip Oil Emulsion Solids	Yes	>10%	4	4.55E+02	420.0	0.19
Final DAF Float	No	>10%	4	2.27E+03	0.0	0.00
Process Lagoon/Stormwater Sludge	No	>10%	4	9.09E+03	0.2	0.00
Storm Sump Solids	No	>10%	4	8.36E+01	0.3	0.00

### WASTE STREAM TYPE

1. Product Tk. Drawdown
2. Process Wastewater
3. Landfill Leachate
4. Solid Waste

### \*\*BENZENE CONCENTRATION

At this time there is not sufficient waste stream data to provide a benzene concentration range.

### Notes:

1. Wastes with <10% water not counted in the total.

**TAB E I BENZENE WASTE OPERATIONS WASTE STREAM REGULATORY STATUS**

39

# EXAMPLE 7

BENZENE NESHAP - 161.357 REPORTING

IDENT.	CONTROL METHOD	WATER CONTENT	WASTE STREAM ANNUAL QUANTITY MEGAGRAMS	BENZENE CONCENTRATION RANGE PPM	BENZENE CONCENTRATION AVERAGE PPM	ANNUAL BENZENE QUANTITY MEGAGRAMS
PROCESS STREAM DESALTER WATER	FED TO BIOLOGICAL TREATMENT SYSTEM (via piping)	> 99%	36000	25-75	53	1.9
PROCESS STREAM KEROSENE WASH WATER	"	> 99%	600	1-10	3	0.0
PROCESS STREAM NAPHTHA WASH WATER	"	> 99%	400	25-75	45	0.0
PROCESS STREAM NAPHTHA K.O. CAUSTIC TREAT	"	> 98%	400	10-60	25	0.0
Total →						1.9

# EXAMPLE 8

## OIL & REFINING

### ESTIMATION OF BENZENE CONCENTRATIONS IN WASTE STREAMS

Benzene Waste Stream	Control Status	Water Content	Waste Stream Type	Annual Waste Quantity (lbs)	Benzene Concentration Range (ppm)	Flow Rated Benzene Concentration (ppm)	Annual Benzene Quantity (lbs)
Crude Unit							
Desalter Water	No Control	>10 %	Process	5.37E+08	7 - 9	8.41	4516
Gasoline Receiver Water	No Control	>10 %	Process	4.40E+07	52 - 62	57.3	2521
Naphtha Receiver Water	No Control	>10 %	Process	3.10E+07	10 - 12	11.4	353
Storage Tanks							
Tank Drawdown	No Control	>10 %	Product Tank Drawdown	4.00E+06	17 - 21	19.5	78
Total Annual Benzene Quantity From Facility Waste							7469

# EXAMPLE 9

BENZENE WASTE OPERATIONS WASTE STREAM REGULATORY STATUS									
FACILITY NAME:		PREPARED BY:		DATE: 6/4/90		PAGE 1		OF 2	
WASTE STREAM CHARACTERISTICS									
WASTE STREAM I.D.	WASTE STREAM TYPE TKWD - TANK WATER DRAW	PLANNED BENZENE CONTROL? (YES/NO)	WATER CONTENT >10% (YES/NO)	ANNUAL WASTE QUANTITY (Mg/Yr)	* BENZENE CONCENTRATION RANGE (PPHW)	* ANNUAL AVERAGE BENZENE CONCENTRATION (PPHW)	ANNUAL BENZENE QUANTITY (Mg/Yr)	TOTAL ANNUAL BENZENE QUANTITY FOR FACILITY WASTE (Mg/Yr)	
20TK	TKWD	NO	YES	624.32	26 - 12000	216	0.1351	0.1351	
21TK	TKWD	NO	YES	624.32	26 - 12000	206	0.1287	0.1287	
22TK	TKWD	NO	YES	624.32	26 - 12000	433	0.2706	0.2706	
16TK	TKWD	NO	YES	624.32	26 - 12000	142	0.0885	0.0885	
97TK	TKWD	NO	YES	416.21	0 - 4000	0	0.0002	0.0002	
96TK	TKWD	NO	YES	416.21	0 - 4000	146	0.0608	0.0608	
95TK	TKWD	NO	YES	416.21	0 - 4000	178	0.0741	0.0741	
92TK	TKWD	NO	YES	416.21	0 - 4000	212	0.0883	0.0883	
59TK	TKWD	NO	YES	416.21	8 - 1800	188	0.0741	0.0741	
60TK	TKWD	NO	YES	208.11	8 - 1800	97	0.0203	0.0203	
61TK	TKWD	NO	YES	208.11	8 - 1800	97	0.0203	0.0203	
62TK	TKWD	NO	YES	208.11	8 - 1800	48	0.0099	0.0099	
62TK	TKWD	NO	YES	208.11	8 - 1800	61	0.0127	0.0127	
73TK	TKWD	NO	YES	208.11	33 - 3300	179	0.0372	0.0372	
75TK	TKWD	NO	YES	416.21	26 - 12000	649	0.2702	0.2702	
76TK	TKWD	NO	YES	624.32	26 - 12000	446	0.2783	0.2783	
77TK	TKWD	NO	YES	624.32	26 - 12000	251	0.1564	0.1564	

\* The benzene concentration range is bounded on the low side by water concentrations and on the high side by oil concentrations. The average represents our best estimate of total benzene concentration in the mixed phase.

# EXAMPLE 9

## BENZENE WASTE OPERATIONS WASTE STREAM REGULATORY STATUS

FACILITY NAME:

PREPARED BY:

DATE: 6/4/90

PAGE 2 OF 2

### WASTE STREAM CHARACTERISTICS

WASTE STREAM I.D.	WASTE STREAM TYPE	PLANNED BENZENE CONTROL? (YES/NO)	WATER CONTENT >10% (YES/NO)	ANNUAL WASTE QUANTITY (Mg/yr)	* BENZENE CONCENTRATION RANGE (PPMW)	* ANNUAL AVERAGE BENZENE CONCENTRATION (PPMW)	ANNUAL BENZENE QUANTITY (Mg/yr)	TOTAL ANNUAL BENZENE QUANTITY FOR FACILITY WASTE (Mg/yr)
78TK	TKWD	NO	YES	624.32	26 - 12000	179	0.1118	0.1118
7TK	TKWD	NO	YES	624.32	14 - 1450	78	0.0163	0.0163
18TK	TKWD	NO	YES	208.11	26 - 12000	444	0.2770	0.2770
8TK	TKWD	NO	YES	2081.07	40 - 4000	216	0.4504	0.4504
P1	PWW	NO	YES	109591.40	15 - 1470	19	2.0577	2.0577
P2	PWW	NO	YES	10034.50	15 - 1470	57	0.5764	0.5764
P3	PWW	NO	YES	19976.28	65 - 6510	95	1.8980	1.8980
P4	PWW	NO	YES	19976.28	25 - 2500	36	0.7289	0.7289
P5	PWW	NO	YES	8138.86	10 - 1000	33	0.2650	0.2650
P6	PWW	NO	YES	8138.61	10 - 1000	33	0.2650	0.2650
P7	PWW	NO	YES	43790.22	2 - 600	7	0.2903	0.2903
P8	PWW	NO	YES	2081.71	40 - 4000	216	0.4504	0.4504
							-----	-----
						TOTAL METRIC TONS	9.28	9.28

\* The benzene concentration range is bounded on the low side by water concentrations and on the high side by oil concentrations. The average represents our best estimate of total benzene concentration in the mixed phase.

# EXAMPLE 10

## BENZENE WASTE OPERATIONS WASTE STREAM REGULATORY STATUS

Facility Name: \_\_\_\_\_ Prepared By: \_\_\_\_\_ Date: 30-May-90

Waste Stream I.D.	Benzene Controls	Water Content	Waste Stream Type	Annual Waste Qty. (Kg/yr)	Benzene Concentration		Annual Benzene Qty (Mg/yr)
					Range (ug/L)	Flow-weighted Annual Avg (ppmw)	
					Lower	Upper	
1	No	>10%	Process Wastewater	3,974,669	0	0	0.00E+00
2	No	>10%	Process Wastewater	3,974,669	0	0	0.00E+00
3	No	>10%	Process Wastewater	27,822,684	0	0	0.00E+00
4	No	>10%	Process Wastewater	220,594,138	2900	3700	7.06E-01
5	No	>10%	Process Wastewater	17,886,011	0	0	0.00E+00
6	No	>10%	Process Wastewater	5,962,004	0	0	0.00E+00
7	No	>10%	Process Wastewater	57,632,703	0	0	0.00E+00
8	No	>10%	Process Wastewater	21,860,680	0	0	0.00E+00
9	No	>10%	Process Wastewater	103,341,398	6900	7200	7.23E-01
10	No	>10%	Process Wastewater	91,417,390	0	0	0.00E+00
11	No	>10%	Process Wastewater	21,860,680	0	0.5	3.72E-06
12	No	>10%	Process Wastewater	176,872,777	6400	6500	1.14E+00
13	No	>10%	Process Wastewater	153,024,762	3800	3900	5.86E-01
14	No	>10%	Process Wastewater	11,924,007	0	0	0.00E+00
15	No	>10%	Process Wastewater	11,924,007	0	0	0.00E+00
16	No	>10%	Process Wastewater	5,962,004	0	0	0.00E+00
17	No	>10%	Process Wastewater	107,316,067	0	0	0.00E+00
18	No	>10%	Process Wastewater	308,036,859	0	0	0.00E+00
19	No	>10%	Process Wastewater	160,974,101	5400	5700	8.97E-01
20	No	>10%	Process Wastewater	141,100,755	0	0	0.00E+00
21	No	>10%	Product Tank Drawdown	5,962,004	3200	4000	2.21E-02
22	No	>10%	Product Tank Drawdown	31,797,353	4000	4600	1.39E-01
23	No	>10%	Product Tank Drawdown	31,797,353	53000	68000	1.88E+00
TOTAL ANNUAL BENZENE Mg/YR =							6.09E+00







## EXAMPLE 12

Table I below lists the analytical results of five (5) samples taken at the influent to the WWTF. The data shows that the WWTF treats 9.5 mega grams/year benzene. This sample point is where all process wastewater from the entire plant comes together, mixes and enters the WWTF. The data indicates a wide range in the benzene concentration, 0.2 mg/l to 5.9 mg/l. Because of this wide variation, will continue to analyze the WWTF influent and will update this report as necessary.

TABLE I  
TOTAL ANNUAL BENZENE QUANTITY

WASTE STREAM	SAMPLE DATE	BZ CONC. (mg/L)	FLOW RATE (10 <sup>3</sup> GAL/D)	BZ QTY MG/YR
WWTF INFLUENT	05/01/90	1.200	1,743	2.9
	05/09/90	5.900	2,209	18.0
	05/16/90	5.400	2,106	15.7
	05/22/90	3.400	2,137	10.1
	05/30/90	0.210	2,550	0.7
FLOW WEIGHTED AVG.		3.192		9.5

Mg = megagram = 10<sup>6</sup> gram

# EXAMPLE 13

CHEMICAL COMPANY, RESIN FINISHING PLANT  
WASTE STREAM INFORMATION - BENZENE WASTE OPERATIONS NESHAP (SUBPART FF)

WASTE STREAM DESCRIPTION	WATER IN WASTE STREAM ANNUAL QTY. (wt. %)	WASTE STREAM ANNUAL QUANTITY (lbs)	BASIS FOR WASTE STREAM ANNUAL QTY. (1, 2 or 3)	BENZENE CONCENTRATION IN WASTE STREAM Annual Avg. (ppm)	Range (ppm)	BASIS FOR BENZENE ANNUAL QUANTITY CONC. (1 or 2)	BENZENE ANNUAL QUANTITY (lbs)	CONTR (Yes/)
TK-502 SUMP	98	22562150	3	7.51	7 - 8	1	170	
TANKFIELD LINE FLUSH	0	10010	3	7500	4000 - 12000	1	89	
UNIT WEIRS	99	6004800	3	42.5	29.6 - 93.9	1	255	
UNIT SUMP SLUDGE	15	2100	1	3532	2500 - 5000	1	7.4	
WASTEWATER STRIPPER BOTTOMS	100	260830000	2	< 1	0 - 1	1	260	
TANKCAR RACK LINE FLUSH	0	1750	3	3395	2500 - 5000	1	7.1	
TK-274 DIKE WATER	99.5	8400	3	< 1	0 - 1	1	0.01	
ECR-161 FILTER DRAINAGE	0	9100	3	< 2	0 - 2	1	0.02	
NIAGRA FILTER FLUSH	0	8400	3	61	40 - 80	2	0.6	
LAB SAMPLE WASTE	0	4200	3	26.8	0 - 50	1	0.1	
LAB SUMP	99	160550	3	41.75	1 - 2000	1	7	
CLEANING SOLVENT	0	700	3	61	40 - 80	2	0.1	

TK-502 SUMP IS A TANK DRAWDOWN, AND THE WASTEWATER STRIPPER BOTTOMS IS A PROCESS WASTEWATER STREAM.  
NO OTHER STREAM IS A PROCESS WASTEWATER, TANK DRAWDOWN, OR LANDFILL LEACHATE.

TOTAL ANNUAL BENZENE QUANTITY FROM FACILITY WASTE AS PER 61.355(a) = 599.4 lbs/YEAR OR 0.32 Mg/YEAR

BASIS FOR ANNUAL QUANTITY DETERMINATION

1 = HIGHEST QUANTITY OF LAST 5 YEARS

2 = MAXIMUM DESIGN CAPACITY OF UNIT

3 = MEASUREMENT REPRESENTATIVE OF MAXIMUM GENERATION RATES

BASIS FOR BENZENE CONCENTRATION

1 = KNOWLEDGE OF WASTE

2 = PROTOCOL MEASUREMENTS

## EXAMPLE 14

Waste Stream	Annual (1989) Tons Injected	Benzene Conc. ppb	Benzene in Stream lbs.
Acrylo Net Stripper Bottoms	266355	5	2
Acrylo Stripper Overheads	91308	25	5
Acrylo Waste Water Column Bottoms	553412	5	6
MMA Waste Acid	276143	6	3

## EXAMPLE 15

A. Total annual (1989) quantity from facility waste - 10,172 pounds

B. Summary of the Benzene Containing Waste Water Streams

LHC III Process Wastewater	Currently Controlled
LHC III Treated Rainwater	Currently Controlled
By-product Alkalinity	Currently Controlled
LHC II Process Wastewater	Currently Controlled
LHC II Division Flow	Uncontrolled
Tank Farm Water Drawdown	Uncontrolled

C. Additional information for Uncontrolled Sources

LHC II Division Flow	-	Stream is greater than 99% water
-	-	Process wastewater
-	-	Range of benzene concentration 10-100 PPM
-	-	Average benzene concentration 52 PPM
-	-	Annual benzene quantity 4309 pounds

Tank Farm Drawdown	-	Stream is greater than 99% water
-	-	Product tank drawdown
-	-	Benzene concentration range 100-1500 PPM
-	-	Average benzene concentration 700 PPM
-	-	Annual benzene quantity 4392 pounds

# EXAMPLE 16

VCN PLANT JUNE 1990

TOTAL ANNUAL BENZENE QUANTITY PER 40 CFR 61.355(a) = 0.11 Mg

WASTE STREAM	BENZENE CONTROLS REQUIRED	>10% WATER	WASTE STREAM TYPE	ANNUAL WASTE QUANTITY	BENZENE CONCENTRATION			ANNUAL BENZENE QUANTITY	61.355(a) BENZENE QUANTITY
					LOWER LIMIT	UPPER LIMIT	FWA AVERAGE		
STEAM STRIPPER BOTTOMS	NO	YES	PWS	192000.00	ND	.1 PPM	.02 PPM	0.004	0.004
CAUSTIC SCRUBBER BOTTOMS	NO	YES	PWS	29700.00	ND	1 PPM	.015 PPM	2.0E-04	0.000
VENT SCRUBBER BOTTOMS	NO	YES	PWS	79600.00	ND	1 PPM	.2 PPM	0.020	0.020
PROCESS AREA STORMWATER	NO	YES	PWS	118000.00	ND	5 PPM	6 PPM	0.070	0.070
EDC/VCN PROCESS EQUIPMENT DRAINS	YES	NO	OTHER	4.50	ND	3500 PPM	2000 PPM	0.009	0.009
EQUIPMENT WASH WATER	NO	YES	PWS	3800.00	ND	5 PPM	1 PPM	0.004	0.004
PROCESS SOLID WASTE	YES	NO	OTHER	68.00	ND	500 PPM	80 PPM	0.005	0.005

NOTES:

ALL NUMBERS WITHOUT UNITS ARE IN MEGAGRAMS (Mg)

ND MEANS NONDETECTABLE

# EXAMPLE 17

Process Waste Streams containing Benzene that are Greater than 10% Water

Point of Generation (Area)	Location in Plant	Maximum Flow (MGD)	Annual Quantity (X106 gal)	Benzene Range (ppb)*	Average Benz Conc (ppb)*	Annual Benzene (lbs)
VT-666	7	0.216	78.84	10-40	22.2	14.6
VT-162	7	0.038	13.87	7000-22000	10690	1237.3
VT-31	11	1.12	408.8	15-45	24.5	83.6
CL-25	6	0.03	10.95	0-30	18	1.6
CL-46	6	0.03	10.95	0-20	14	1.3
EV-19	6	8	2920	0-47	14.2	346.0
EV-27	6	8	2920	0-63	14.4	350.9

TOTAL BENZENE  
( > 10% Water)

2035.4

Process Waste Streams containing Benzene that are less than 10% Water

Point of Generation (Area)	Location in Plant	Maximum Flow (lb/purg)	Annual Quantity (lb/year)	Benzene Range (%)	Average Benz Conc (%)	Annual Benzene (lbs)
VT-245	16	105000	210000	12.1-32.6	19.2	40320.0

TOTAL BENZENE  
( < 10% Water)

40320.0

# EXAMPLE 18

CHEMICAL COMPANY: A CHEMICAL PLANT-ETHYLENE UNIT JUNE 1990  
TOTAL ANNUAL BENZENE QUANTITY PER 40 CFR 61.355(a) = 553.60 Mg

WASTE STREAM	BENZENE CONTROLS REQUIRED	>10% WATER	WASTE STREAM TYPE	ANNUAL WASTE QUANTITY	BENZENE CONCENTRATION			ANNUAL BENZENE QUANTITY	61.355(a) BENZENE QUANTITY
					LOWER LIMIT	UPPER LIMIT	FWA AVERAGE		
CRACKING AREA EXCHANGER CLEANING	NO	YES	PWS	3555.00	1 PPB	1 PPM	2 PPB	-	-
CRACKING AREA EXCHANGER DRAINAGE	YES	NO	OTHER	0.11	100 PPM	1%	1%	-	-
QUENCH SETTLER BLOWDOWN	YES	YES	PWS	232236.00	250 PPM	4%	200%	464.47	NA
QUENCH TOWER BLOWDOWN	YES	YES	PWS	231.00	5%	22%	21.5%	49.70	49.70
SECONDARY TLE OIL DRAINAGE	YES	NO	OTHER	3.00	50 PPM	5%	5%	0.20	0.20
QUENCH SYSTEM CLEANING WITH INJECTION OIL	YES	NO	OTHER	30.00	5%	5%	5%	1.52	1.52
QUENCH SYSTEM CLEANING WITH WATER TO 915 TANK	YES	YES	PWS	430.00	10 PPM	37%	745 PPM	0.32	NA
QUENCH SYSTEM CLEANING WITH WATER TO OILY WATER SEWER	YES	YES	PWS	48.00	10 PPM	37%	745 PPM	0.04	0.04
QUENCH AREA PROCESS DRAINAGE FOR PUMPS GA-104, P7-305, GA-101/S	NO	YES	PWS	0.38	100 PPM	4%	37%	2.0E-03	2.0E-03
QUENCH AREA PROCESS DRAINAGE FOR PUMPS GA-102/S	YES	NO	OTHER	0.04	5%	22%	21.5%	0.01	0.01
QUENCH AREA SLUDGE	YES	NO	OTHER	26.00	5%	22%	21.5%	5.50	5.50
QUENCH AREA COKE	YES	NO	OTHER	0.38	ND	50 PPM	50 PPM	-	-
QUENCH AREA EXCHANGER CLEANING	NO	YES	PWS	10.22	ND	5 PPM	5 PPM	-	-

# EXAMPLE 18

WASTE STREAM	BENZENE CONTROLS REQUIRED	>10% WATER	WASTE STREAM TYPE	ANNUAL WASTE QUANTITY	BENZENE CONCENTRATION			ANNUAL BENZENE QUANTITY	61.355(4) BENZENE QUANTITY
					LOWER LIMIT	UPPER LIMIT	FWA AVERAGE		
QUENCH AREA INSTRUMENTATION DRAINAGE	NO	YES	PWS	3.0E-03	250 PPM	4%	.37%	-	-
SULFIDE CAUSTIC TANK CLEANOUT	YES	YES	PWS	57.80	10 PPM	5%	3.8%	2.23	2.23
CAUSTIC TOWER AREA PUMP AND FILTER DRAINAGE	NO	YES	PWS	0.15	85 PPM	95 PPM	89 PPM	-	-
CAUSTIC TOWER CLEANOUT	YES	YES	PWS	88.90	10 PPM	95 PPM	89 PPM	0.01	0.01
CHARGE GAS COMPRESSOR CLEANING	YES	YES	PWS	0.58	10 PPM	2.2%	2.1%	0.01	0.01
CHARGE GAS COMPRESSOR K.O. DRUM FA-201 PROCESS DRAINAGE	YES	YES	PWS	7034.40	450 PPM	550 PPM	500 PPM	3.52	2.0E-03
CHARGE GAS COMPRESSOR K.O. DRUMS FA-202 - FA-207 PROCESS DRAINAGE	NO	YES	PWS	4.90	650 PPM	8.3%	1.9%	0.09	0.09
COMPRESSOR AREA EXCHANGER CLEANING EA-201	NO	YES	PWS	4.54	10 PPM	100 PPM	60 PPM	-	-
COMPRESSOR AREA EXCHANGER CLEANING EA-202	NO	YES	PWS	4.54	10 PPM	100 PPM	60 PPM	-	-
COMPRESSOR AREA EXCHANGER CLEANING EA-203	NO	YES	PWS	4.54	10 PPM	100 PPM	60 PPM	-	-
COMPRESSOR AND CAUSTIC TOWER AREA INSTRUMENTATION DRAINAGE	NO	YES	PWS	0.01	1300 PPM	1500 PPM	1400 PPM	-	-
COMPRESSOR AREA INJECTOR OIL	YES	NO	OTHER	0.01	1.9%	2.1%	2%	-	-
COMPRESSOR AREA COKE	YES	NO	OTHER	0.02	10 PPM	500 PPM	500 PPM	-	-



## EXAMPLE 19

### WASTE STREAMS THAT WILL BE CONTROLLED FOR BENZENE

WASTE STREAM DESCRIPTION	AVERAGE BENZENE CONCENTRATION (PPMW)	ANNUAL BENZENE QUANTITY EXPECTED *LBS/YR.
Quench Water (D-1) Blowdown	410	2,302
Dispensed Oil Extraction (DOX) Blowdown	558	8,643
Saturator (D-68) Blowdown	77	4,460
Compressor Knock-Out (D-2) Blowdown	181	760
Spent Caustic (D-17)	5	120
Wash Water (D-18)	947	21,669
Caustic Sump	587	10,759
Fuel Oil Stripper Separator (D-49)	790	3,288
Fuel Oil Tank Blowdown (FA-712)	30,333	6,954
TOTAL ANNUAL BENZENE QUANTITY EXPECTED		58,955

\*10 MEGAGRAMS/YEAR = 22,046 LBS/YEAR

# EXAMPLE 20

## TOTAL BENZENE IN WASTE WATER BEFORE ENHANCED ACTIVATED SLUDGE PRETREATMENT

WASTE STREAM	CONTROLLED?	>10% H <sub>2</sub> O	ANNUAL WASTE QUANTITY (Total Flow) gal/yr	BENZENE CONCENTRATION (mg/l)	ANNUAL AVERAGE CONCENTRATION (mg/l)	ANNUAL BENZENE QUANTITY (grams)
Gas Condensate	No	Yes	3,581,000	0 - 72.8	49.3	610,018
PH Day Tank	No	Yes	1,715,500	8.9	8.9	57,810
Scrubber Drip Leg	No	Yes	109,500	30.9	30.9	1,526
Oil Scrubber Sump	No	Yes	401,500	6.8	6.8	10,338
Oxide Box Seals	No	Yes	2,190,000	35.9	35.9	297,689
Glycol Blowdown	No	Yes	21,900,000	37.8	37.8	3,134,425
Oxide Box Blowdown	No	Yes	600,000	15.8	15.8	35,895
Still Bottom Wst/Water	No	Yes	165,710	.598	.598	104,728

## TOTAL BENZENE IN WASTE EXPOSED TO ATMOSPHERE THAT DOES NOT GO TO ACTIVATED SLUDGE PRETREATMENT

Sludge (to recycle)	No	Yes	3,218 lb/day	201 Mg/Kg	201 Mg/Kg	107,184
Oxide	No	Yes	9x10 <sup>6</sup> lb/yr	12.2 Mg/Kg	12.2 Mg/Kg	49,849
						4,409,460 grams/yr or 4.409 Mg/yr

**APPENDIX D**

**List of Air and Non-Air Federal Regulations  
Affecting the Regulated Industry**



**APPENDIX D**  
**LIST OF ENVIRONMENTAL REGULATIONS AFFECTING THOSE FACILITIES**  
**UNDER THE BENZENE WASTE OPERATIONS NESHAP**

There are four types of facilities that are affected by the Benzene Waste Operations NESHAP: petroleum refineries; chemical plants; coke by-product plants; and hazardous waste treatment, storage, and disposal facilities. Below is a list of environmental regulations that might possibly affect these types of facilities. This list is not all inclusive; it is provided solely to assist the reviewer.

**CLEAN AIR ACT (CAA)**

[42 U.S.C. §§7401 - 7642]

National Emission Standards for Hazardous Air Pollutants

[40 CFR §61]

- Subpart J - Equipment Leaks (Fugitive Emission Sources) of Benzene
- Subpart L - Benzene Emissions from Coke By-Product Recovery Plants
- Subpart V - Equipment Leaks (Fugitive Emissions Sources)
- Subpart Y - Benzene Emissions from Benzene Storage Vessels
- Subpart BB - Benzene Emissions from Benzene Transfer Operations

Standards of Performance for New Stationary Sources

[40 CFR §60]

- Subpart E - Incinerators
- Subpart G - Nitric Acid Plants
- Subpart H - Sulfuric Acid Plants
- Subpart J - Petroleum Refineries
- Subpart O - Sewage Treatment Plants
- Subparts T through X - Phosphate Fertilizer Industry
- Subpart PP - Ammonium Sulfate Manufacture
- Subpart VV - Equipment Leaks of VOC in the Synthetic Organic Manufacturing Industry
- Subpart XX - Bulk Gasoline Terminals
- Subpart DDD - VOC Emissions from the Polymer Manufacturing Industry
- Subpart GGG - Equipment Leaks of VOC in Petroleum Refineries
- Subpart QQQ - VOC Emissions from Petroleum Refinery Wastewater Systems

Hazardous Organic NESHAP [under development]

MACT Standards for Petroleum Refineries [under development]

Diesel Fuel Quality Standards [40 CFR §80.29]

VOC Emissions from Tank Vessel Loading Operations [11/00/92]

Accidental Release Risk Management Plans [11/93]

Oxygenated Fuel Requirements [8/91]

General Provisions for Major and Area Sources of Air Toxics  
[11/92]

Volatility Regulations for Gasoline and Alcohol Blends sold in  
1992 and Beyond [40 CFR §80.27]

Reformulated Gasoline and Anti-Dumping Rules [11/91]

NO<sub>x</sub> RACT Provisions Under Title I and Title IV

Fuel and Fuel Additives Diesel Fuel Quality and Sulfur Content  
et al. [40 CFR Part 80 & 86]

Lead Ban in Gasoline [11/91]

Steady Progress Requirements in Nonattainment Areas [notice  
7/91]

**RESOURCE CONSERVATION RECOVERY ACT OF 1976 (RCRA - Solid Waste  
Disposal Act)**  
[42 U.S.C. §§6901 - 6991]

Standards Applicable to Generators of Hazardous Waste  
[40 CFR §262]

Standards Applicable to Transporter of Hazardous Waste  
[40 CFR §263]

Standards for Owners and Operators of Hazardous Waste  
Treatment, Storage, and Disposal Facilities [40 CFR §263]

Hazardous Waste Treatment, Storage, and Disposal Facilities -  
Organic Air Emissions Standards for Process Vents and  
Equipment Leaks [40 CFR §260]

Hazardous Waste Treatment, Storage, and Disposal Facilities -  
Organic Air Emission Standards for Tanks, Surface  
Impoundments, and Containers [40 CFR §60 et al.]

Burning of Hazardous Waste in Boilers and Industrial Furnaces  
[40 CFR §260 et al.]

De minimus exemption levels [40 CFR §66.33]

Identification and listing of hazardous waste, used oil [40 CFR §261]

Land disposal restrictions for petroleum sludges [5/92]

Land disposal restrictions for TC wastes [4/93]

No migration variances [9/91]

Liner and leak detection requirements for hazardous waste disposal units [40 CFR 260 et al.]

Corrective action for hazardous waste management facilities [7/24/90]

Amendments to groundwater monitoring requirements for hazardous waste facilities [8/91]

**CLEAN WATER ACT (Federal Water Pollution Control Act - FWCPA)** [33 U.S.C. §§1251 - 1387]

Effluent Guidelines for the Wastes Treatment Category [11/96 - 40 CFR §260.1]

Oil Pollution Prevention Regulation I and II

Denial or Restriction of Disposal Sites (Revision)

NPDES Regulations: Stormwater Implementation Rule (Revisions)

Water Quality Standards for Toxic Pollutants [40 CFR §131]

NPDES Permit Application Standard Form A and Short Form A (Revision) [6/92]

Toxic Pollutant Effluent Standards [40 CFR §129]

**COASTAL ZONE MANAGEMENT ACT OF 1972 (CZMA)**  
[16 U.S.C.A. §§1451 TO 1454]

**COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (CERCLA)**  
[42 U.S.C. §§9601 -9675]

**EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT OF 1986 (EPCRTKA)**  
[42 U.S.C.A. §§11001 TO 11050]

**FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)**  
[7 U.S.C. 21136 TO 136y]

**FEDERAL LAND POLICY AND MANAGEMENT ACT OF 1976 (FLPMA)**  
[43 U.S.C.A. §§1701 TO 1784]

**NATIONAL OCEAN POLLUTION PLANNING ACT OF 1978 (NOPPA)**  
[33 U.S.C.A. §§1701 TO 1709]

**OCEAN DUMPING BAN ACT OF 1988 (Marine Protection, Research, and Sanctuaries Act of 1972)**  
[33 U.S.C.A. §§1414b, 1414c]

**OIL POLLUTION ACT OF 1990 (OPA)**  
[33 U.S.C.A. §§2701 TO 2761]

**POLLUTION PREVENTION ACT OF 1990 (PPA)**  
[42 U.S.C.A. §§13101 TO 13109]

**SHORE PROTECTION ACT OF 1988 (SPA)**  
[33 U.S.C.A. §§2601 TO 2609 & 2621 TO 2623]

**SAFE DRINKING WATER ACT (SDWA)**  
[42 U.S.C.A. §§300F TO 300J-11]

Revisions to the SDWA UIC Regulations [7/91]

Management of Class V Injection Wells [1/92]

Construction Requirements for Class II Wells Under Part C  
[1/92]

**SOIL AND WATER RESOURCES CONSERVATION ACT OF 1977 (SWRCA)**  
[16 U.S.C.A. §§2001 TO 2009]

**TOXIC SUBSTANCES CONTROL ACT (TSCA)**  
[15 U.S.C. §§2601 - 2671]