

LC LAB



Interoffice Communication

RECEIVED

To H. J. Neeld, Lake Charles, Louisiana
From C. R. Dutra, Ponca City, Oklahoma
Date February 7, 1980
Subject Revised Hydrocarbon Emissions--LAB Project

FEB 10 1980

Attached is a revised draft of our response to EPA's comments on hydrocarbon emissions. The original draft dated January 22, 1980, has been revised to reflect comments from Dr. Leigh Short of ERT during our meeting of January 28. The total hydrocarbon emissions calculated on the basis described in the draft are 48.5 tons per year including 38.8 tons per year of "fugitive" emissions and 1.9 tons per year of "transit" emissions.

Several important decisions and clarifications are required before the permit application is resubmitted to the EPA. These points are discussed in the following paragraphs:

1. Process Changes

In order to reduce the total hydrocarbon emissions to below 50 tons per year, I have assumed the application of control devices not currently in the LAB process design. Specifically, these are the use of double mechanical seals on the Pacol stripper overhead pumps and the venting of the Pacol hydrogen compressor distance piece to the flare.

If it is determined that fugitive emissions do not count toward the 50-ton limit or if the hydrocarbons can be over 50 tons (but less than 100 tons), we would not apply these process changes. A decision on whether we should apply these additional controls is needed as soon as possible so that we may direct Braun to make the necessary changes in the design.

2. Fired Heater Calculations

In review of the new documents relating to hydrocarbon emissions, we have determined that the AP-42 factors used for calculation of fired heater emissions have been updated in subsequent publications. Specifically, these factors allowed us to reduce the calculated hydrocarbon emissions from the heaters. The original permit showed 7.20 tons per year of hydrocarbons from the heater, and the new factors show only 2.64 tons per year. The change in factors is marked in the copy of the original permit application that S. H. Christiansen forwarded to you on January 29. The fired heater calculations must be revised as noted in order to stay below the 50 ton per year total hydrocarbons in the revised permit application.

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3. Tankage Calculations - AP-42

The storage tanks, which, according to Dr. Short, should be considered as point sources, have been recalculated using the factors suggested by the EPA from AP-42, Supplement 7. The change results in slightly higher hydrocarbon emissions (3.63 versus the original 2.13 tons per year) due primarily to the IFR benzene tanks. The calculations are summarized in Table III of the attached draft, and S. H. Christiansen forwarded copies of the detailed calculation sheets for these tanks on January 28. These calculation sheets should be incorporated into the revised permit application.

4. Tankage Calculations - EPA-450

Dr. Short indicated that the EPA may consider EPA-450, "Measurement of Benzene Emissions from a Floating Roof Test Tank," dated May 1979 more applicable for calculation of our IFR tanks than the AP-42 equations. The benzene tank emissions were recalculated based on EPA-450, and the total hydrocarbon (benzene) emissions were calculated as 1.64 tons per year versus 1.65 tons per year using the AP-42 factors. The emissions in Table III of the attached draft were calculated using the AP-42 rather than the EPA-450 factors; however, S. H. Christiansen forwarded to you on January 30 detailed calculation sheets based on the EPA-450 equations. If the permit application is to be resubmitted using the EPA-450 equations, Table III will need to be revised, and the EPA-450 tank calculation sheets will need to be substituted for tanks T-807, T-808, and T-1001.

5. Transit Emissions

Transit emissions for the LAB project have been estimated based on equations in AP-42 and are included in the attached draft as Table IV-C. Dr. Short was of the opinion that transit emissions did not apply; however, this is in conflict with your conversation with Mr. Peterson of the EPA. In addition, we still have not confirmed if our application of the AP-42 equation is correct. (Dr. Short is still to give us additional information on the correct calculation procedure.) Before resubmission of the permit application, it should be determined if we are required to include transit emissions. If transit emissions are required, it must be determined that we have applied the equations in a manner acceptable to the EPA.

6. Use of Non-Standard Factors

In order to demonstrate that the total hydrocarbon emissions from the LAB project are less than 50 tons per year, we have claimed fugitive emission reductions for certain control technologies utilized which are not specifically covered in either AP-42 or EPA-600. Each of these claims is documented in the attached draft; however, if the EPA does not agree with the analysis, we will not be able to stay under 50 tons per year of total hydrocarbons.

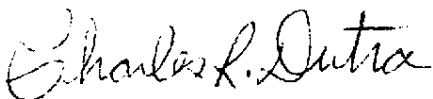
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7. Application of PSD

Based on our conversation of February 4, it may not be necessary to include fugitive emissions in the determination of major sources status. If this is true, then the hydrocarbon emissions from the LAB project will be only 7.8 tons per year from point sources. In any case, we should correct the applicable storage tank and fired heater calculations to use the latest AP-42 factors as described in the attached draft.

Please keep me informed of the status of the permit resubmission. The resubmitted permit should be reviewed by S. H. Christiansen or myself prior to submittal to insure that all of the appropriate changes have been made.



C. R. Dutra
Supervising Process Engineer
Chemicals Division
Process Engineering Department

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FUGITIVE HYDROCARBON EMISSIONS

Fugitive hydrocarbon emissions for the proposed 150 MM pound per year Linear Alkylbenzene Unit are summarized in Table IV.B. The emission estimates are based on factors from Table 9.1-2 of Supplement 8 to AP-42 dated December 1977 and Table 4-2 of EPA-600/2-79-044, February 1979, "Emission Factors and Frequency of Leak Occurrence for Fittings in Refinery Process Units," with modifications to certain of the categories to reflect the control devices utilized in the Linear Alkylbenzene Unit. In addition, several of the emission sources listed in Tables 9.1-2 are applicable only to refineries and have no meaning as applied to the Linear Alkylbenzene Unit. These exceptions and justifications for utilizing modified factors are discussed in the following paragraphs.

Emission factors from Table 9-1 of AP-42 for "Asphalt Blowing" and "Blind Changing" are not applicable to the Linear Alkylbenzene Unit, since these are operations peculiar to refineries and are not applicable to the Linear Alkylbenzene Process. Similarly, emission factors for "Miscellaneous Sources" are not applicable to the Linear Alkylbenzene Unit. Under the miscellaneous category, the only listed sources which have any meaning for the Linear Alkylbenzene Unit are "Sampling" and "Purging;" however, both of these sources result in negligible emissions in the Linear Alkylbenzene Unit because of the application of control devices. Emission estimates for certain of the sources (eg, process drains, valves, flanges, and seals) are taken from EPA-600 rather than AP-42.

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Fugitive Hydrocarbon Emissions
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MISCELLANEOUS SOURCES

Sampling

The only volatile hydrocarbon sampled in the Linear Alkylbenzene Unit is benzene. Benzene, because of its toxicity, is sampled in special closed loop sample systems which eliminate emissions to the atmosphere (see Figure 6). A closed loop sample system is also utilized for streams containing HF acid. Other hydrocarbons sampled are heavy liquids and, at the temperatures sampled, result in negligible emissions due to the low vapor pressures of these streams. Sample coolers are utilized as necessary to reduce the temperature of process streams.

Purging

The only routine purging operations in the Linear Alkylbenzene Unit occur during catalyst changeouts. In these cases, the purge gas is vented to the flare and results in negligible atmospheric emissions.

OTHER FUGITIVE EMISSION SOURCES

The emission sources listed in Table 4-2 of EPA-600 are estimated from Piping and Instrument and Process Flow diagrams of the proposed Linear Alkylbenzene Unit. Grouping of the service classification of the streams (gas, light liquid, heavy liquid) is based on the designations in Table 3-3 of EPA-600 and the guidelines from EPA-600 that the stream be classified based on the most volatile component present in a concentration of 20 percent or more. Discussion of the emission factors used for each source is discussed in the following paragraphs.

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GAS/VAPOR SERVICE VALVES

The total emissions from these sources are estimated as 14.9 tons per year based on the factors from Table 4-2 of EPA-600. It is believed that this estimate is conservative and the actual emissions will be considerably less. Several of these valves operate under vacuum conditions such that any leakage would be into the process unit rather than to the atmosphere. The effect of the air leakage is accounted for in the emission estimates for the vacuum system vents, LV-1 and LV-2. Elimination of these valves as contributors to fugitive emissions would reduce the estimated emissions. In addition, some of the gas service valves are in high purity (95 mol percent) hydrogen service. Leakage from these valves will contain only 30 weight percent hydrocarbons. Consideration of the composition in the leakage will reduce the estimated hydrocarbon emissions from these valves by 70 percent. Many of the gas service valves are in HF acid or benzene service, which, because of their toxicity, are subjected to special controls. Valves in HF acid service are equipped with special sealing materials and are monitored continuously for leakage by the use of special HF indicating paint. Valves in benzene service areas are monitored by continuous fixed multipoint area analyzers. Because of these controls, the leakage from gas/vapor valves in these services will be much less than from normal service valves because of the improved leak detection efficiency. Based on the special controls applied to the Linear Alkylbenzene Process, it is expected that the total emissions from gas service valves will actually be considerably less than the calculated 14.9 tons per year.

LIGHT LIQUID SERVICE VALVES

The total emissions from these sources are estimated as 8.2 tons per year based on the factors from Table 4-2 of EPA-600. The majority of the light liquid valves are in services which contain benzene which are subjected to the special controls because of toxicity. In addition, many of the valves in this service have significant HF and are monitored by the use of the special HF indicating point. Because of the controls, it is expected that the emissions from light liquid valves in these services will be much less than normal. Based on the special controls applied in the Linear Alkylbenzene Process, it is expected that the total emissions from light liquid service valves will be considerably less than the calculated 8.2 tons per year.

HEAVY LIQUID SERVICE VALVES

The total emissions from these sources are estimated as 1.7 tons per year based on the factors from Table 4-2 of EPA-600. Many of these valves contain either significant quantities of benzene (at least 10 percent but less than 20 percent benzene) or contain some HF acid. Because of the previously described special valves and monitoring programs applied to benzene and HF acid containing streams, it is expected that the emissions from heavy liquid valves in these services will be much less than normal. Based on the special controls applied to the Linear Alkylbenzene Process, it is expected that the total emissions from the heavy liquid service valves will actually be considerably less than the calculated 1.7 tons per year.

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FLANGES

The total emissions from the sources are estimated as 6.9 tons per year based on the factors from Table 4-2 of EPA-600. The services of the flanges closely parallel the services of valves in the Linear Alkylbenzene Unit. Based on the analysis of the valve services and the special controls applied to the HF acid and benzene containing streams, it is expected that the emissions from many of the flanges in these services will be much less than normal. Based on the special controls applied to the Linear Alkylbenzene Process, it is expected that the total emissions from flanges will be considerably less than the calculated 6.9 tons per year.

PUMP SEALS

The total emissions from these sources are estimated as 4.6 tons per year based on the factors from Table 4-2 of EPA-600. Single mechanical seals are used for all hydrocarbon process pumps in heavy liquid service. Mechanical seals are used because of their low leakage rate, as compared to other types of seals. Double mechanical seals are used in all pumps in which the pumped fluid contains significant quantities of benzene, HF acid, or light hydrocarbon. Pumps equipped with double mechanical seals are treated as heavy liquid pumps for the purpose of emissions estimation based on the fact that the heavy liquid seal fluid is the only hydrocarbon which can leak to the atmosphere (see Figure 1). The heavy liquid seal fluid is circulated in a closed system at a pressure higher than the maximum pressure of the process fluid. Because of the use of double mechanical seals, pumps which would ordinarily be classified as light liquid service by the criteria of Table 3-3 of EPA-600 are classified as heavy liquid service. Manufacturers'

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PUMP SEALS (CONTINUED)

data indicate that the actual leakage rate from mechanical seals will ordinarily be no more than 25 to 150 cc per day of liquid, as compared to the over 600 cc per day equivalent leakage rate of the EPA factor for heavy liquid pumps. One seal manufacturer has calculated the expected leakage rate for a typical pump in LAB service to be only 60 cc per day. Based on the manufacturers' data, it is expected that the actual leakage rate from these sources will be much less than the 4.6 tons per year calculated using the factors from EPA-600.

PROCESS DRAINS

The total emissions from these sources are estimated as 1.7 tons per year based on factors from Table 4-2 of EPA-600. This estimate is based on the factors for heavy liquid drains. All of the process drains which could be classified as light liquid drains in the Linear Alkylbenzene Process are in benzene service. In these services, the special control of a closed drain system has been imposed because of the toxic nature of benzene (see Figure 3). This extensive control device eliminates atmospheric emissions from draining of this equipment. Drains from light liquid sources are collected in a closed drain header system and phase separated in a closed phase separation device (a double sealed internal floating roof nitrogen-blanketed tank). The light liquid-containing phase is pumped to a pressurized storage vessel venting to the flare, and the water phase is transferred to a waste water stripping unit where the benzene and lighter hydrocarbons are removed from the water phase before further biological treatment to remove the remaining BOD. Light liquid hydrocarbon emissions

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PROCESS DRAINS (CONTINUED)

from the internal floating roof tank and the pump seals are accounted for in the emission summaries from these sources. For these reasons, the emissions from the light liquid drains are negligible and are not included in the fugitive emissions summary. In addition, process drains in HF acid service are provided similar special controls of closed neutralization and drain systems. Emissions from these sources are also negligible.

COMPRESSOR SEALS

The only compressors in the Linear Alkylbenzene Process are in high purity (95 mol percent H₂) service; thus the factors for hydrocarbon service compressors do not apply. The hydrogen service compressor seals in the Linear Alkylbenzene Process total eight (one for each cylinder). These compressors are equipped with dual distance pieces venting to the flare (see Figure 2). The pressure in the two distance pieces will be essentially the same; therefore, no leakage will occur between the two distance pieces, and all the process vents will leak to the flare where they will be incinerated, resulting in negligible atmospheric emissions. In addition, because of the high purity of the hydrogen stream, only 30 weight percent of the stream vented to the flare will be nonmethane hydrocarbon. Based on venting of the seal leakage to the flare, no emissions are claimed from these sources in the fugitive emissions summary.

RELIEF VALVES

The total emissions from these sources is negligible based on the emission factors in AP-42 and EPA-600. All of the relief valves in the Linear Alkylbenzene Process are vented to a closed blowdown and flare system, which,

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RELIEF VALVES (CONTINUED)

by definition in AP-42 and EPA-600, result in negligible emissions. Relief valves in HF acid service are vented to a separate closed neutralization and blowdown system which further reduces the possibility of atmospheric emissions. Based on venting of relief valves to the flare, no emissions from these sources are claimed in the fugitive emissions summary.

COOLING TOWER

The total emissions from this service is estimated to be 0.8 ton per year based on modified factors from Table 9.1-2 of Supplement 8 to AP-42. The modified factor is taken as 15 percent of the uncontrolled emission factor from AP-42. The emission factor reduction is justified based on the special control devices utilized in the Linear Alkylbenzene Process due to the processing of HF acid. Eighty-five percent of the total annual cooling water circulation rate of 1,835 MM gallons is in HF acid service. Because of the toxic and corrosive nature of HF acid, exchangers in this service have been equipped with seal-welded tubes and special fluoride ion monitoring devices in the return cooling water (see Figure 4). Leakage cannot be tolerated because of the corrosive and toxic nature of HF acid. The use of seal welding on the tubes minimizes the chance of leaks (as opposed to the normal "rolled seal" for process exchangers). However, if a leak should occur, it would be detected by the continuous analyzer; and the process would be shut down to repair the leak to avoid exposure and equipment damage. The remaining 15 percent of the process exchangers are of normal construction, and the 15 percent factor is applied as a conservative adjustment to account for leakage from these exchangers.

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SUMMARY OF EMISSIONS

The total fugitive hydrocarbon emissions from the Linear Alkylbenzene Unit are estimated to be 38.8 tons per year based on the emission factors of AP-42 and EPA-600 with the modifications as described in the preceding paragraphs. It is expected that the actual fugitive emissions will be considerably less based on the use of special control equipment in the Linear Alkylbenzene Unit.

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CONTROLS UTILIZED IN THE LINEAR ALPHYL BENZENE UNIT TO
MINIMIZE ATMOSPHERIC EMISSIONS OF HYDROCARBONS

1. Waste water stripping to remove benzene.
2. Closed segregated aromatics sewer in benzene service.
3. Utilization of double-sealed, nitrogen-blanketed, internal floating roof or pressurized tanks for benzene services.
4. Use of double mechanical seals in light liquid and benzene pumps.
5. Continuous monitoring for benzene utilizing a fixed multipoint analyzer.
6. Continuous monitoring for combustibles utilizing fixed point analyzers.
7. Closed segregated sewers for HF acid service.
8. A closed neutralization system venting to the flare to remove HF acid from reliefs.
9. Use of double mechanical seals on HF acid pumps.
10. Closed sample system for benzene streams.
11. Closed sample system for HF acid streams.
12. Use of continuous oxygen and combustible analyzers on fired heaters to monitor combustion efficiency.
13. Steam addition and pilots in the flare for more efficient combustion.
14. Venting of process equipment and relief valves to the closed blowdown system (flare).
15. Use of surface condensers on vacuum vents.
16. Continuous monitoring of HF acid valves and flanges by the use of orange "HF" indicating paint No. 220-Y-7 manufactured by Mobil Chemical Company.
17. Use of seal-welded exchangers in HF acid service.
18. Use of a continuous fluoride ion analyzer on the cooling water return line.

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Controls Utilized in the Linear
Alkylbenzene Unit
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19. Minimizing the number of flanges and valves in HF acid service.
20. Venting of hydrogen compressor seal leakage to the flare.
21. The use of portable combustible analyzers in inspection and maintenance practices.

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STORAGE TANK EMISSIONS

Storage tank emissions for the Linear Alkylbenzene Unit are summarized in Table III. Three basic types of storage devices are used in the Linear Alkylbenzene Process. Cone roof tanks are used for storage of heavy liquids with low vapor pressures. Double-sealed internal floating roof tanks with nitrogen blanketing are used for storage of large quantities of volatile hydrocarbons (principally benzene). Smaller quantities of benzene are stored in pressurized storage vessels venting to the flare. Emissions from cone roof and internal floating roof tanks are estimated based on equations in Section 4.3 of Supplement 7 to AP-42 dated April 1977. Emissions from the storage vessels venting to the flare are negligible and are not included in the storage tank emissions summary. The total emissions from storage tanks are estimated to be 3.63 tons per year based on the AP-42 equations, as summarized in Table II.

The AP-42 equations for windage loss from floating roof tanks are adjusted to account for the use of dual seals and nitrogen blanketing (see Figure 5). According to Volume 43; No. 47; May 18, 1978; Page 21616, of the Federal Register, windage losses from floating roof tanks may be reduced by 75 percent when dual seals are used. The windage losses from these internal floating roof tanks have been calculated based on a four mile per hour wind speed, as suggested on Page 4.3-13 of AP-42, Supplement 7. However, the nitrogen-blanketed internal floating roof tanks used in the LAB process do not have the wind screen vents of a normally constructed internal floating roof tank. Therefore, the external wind velocity has no effect on emissions from blanketed tanks. The windage losses from these tanks would, theoretically, be zero. The actual windage losses are expected

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Storage Tank Emissions
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to be much less than the AP-42 calculations, which would reduce the total estimated tankage emissions.

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LOADING EMISSIONS

Loading emissions for the Linear Alkylbenzene Unit are summarized in Table IV-A. The total emissions are estimated to be 0.07 ton per year based on the equations in Section 4.4 of Supplement 7 to AP-42 dated April 1977. The emissions are calculated based on the assumption of clean tank cars or dedicated service tank cars. This assumption is justified based on the fact that the only products loaded are high purity chemical compounds in which no contamination can be tolerated. In addition, dedicated tank cars are provided for the linear alkylbenzene product. Loading emissions are estimated only for the linear alkylbenzene product, and the by-product paraffins and bottoms products. There are no loading losses associated with raw material transfers since these materials are transferred directly from other process units or from tank cars to their respective storage tanks. The only emissions from these operations will be from the storage tanks, and these emissions are already accounted for in the calculation of storage tank emissions summarized in Table III.

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TRANSIT LOSSES

Transit emissions for the LAB process are estimated as 1.91 tons per year based on equation (2), page 4.4-7, of Supplement 7 of AP-42 dated April 1977. It is expected that the emissions from transport of products and feedstocks will not all occur in the vicinity of the plant. The emissions are summarized in Table IV-C. Paraffin feedstocks and certain of the plant by-products come from other process units or are internally consumed and have no transit losses associated with them.

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TABLE I
STORAGE TANK HYDROCARBON EMISSION ESTIMATES FOR THE
PROPOSED LINEAR ALKYL BENZENE UNIT

Tank No.	Description	Type	TONS/YEAR		
			Breathing Losses (1)	Working Losses (1)	Total Losses
T-801	N-550L or N-600L	CR	<0.01	<0.01	<0.01
T-802	N-550L or N-600L	CR	<0.01	<0.01	<0.01
T-803	N-600L LAB	CR	0.01	<0.01	0.01
T-804	N-600L LAB	CR	0.01	<0.01	0.01
T-805	N-550L LAB	CP	0.03	<0.01	0.03
T-806	N-550L LAB	CR	0.03	<0.01	0.03
T-807	Off-Spec LAB	IFR	0.14	0.06	0.20
T-808	Benzene	IFR	0.49	0.17	0.67
T-809	N-550L Heavy Charge	CR	<0.01	<0.01	<0.01
T-810	LMR N-550L	CR	<0.01	<0.01	<0.01
T-811	LMR N-600L	CR	<0.01	<0.01	<0.01
T-812	N-600L Heavy Charge	CR	<0.01	<0.01	<0.01
T-1001	Waste Water	IFR	0.21	0.57	0.78
T-815	N-550L Paraffins	CR	0.43	0.15	0.58
T-816	N-600L Paraffins	CR	0.17	0.04	0.21
T-817	C ₁₅ + Paraffins	CR	0.04	<0.01	0.04
T-818	C _{10/11} Paraffins	CR	0.38	0.05	0.42
T-819	C _{12/16} Paraffins	CR	0.37	0.05	0.42
T-820	C _{10/16} Paraffins	CR	0.17	0.06	0.23
	Total		2.48	1.15	3.63

(1) Working and breathing losses calculated using procedures in Section 4.3 of Supplement 7 to Public Health Service Publication 999-AP-42. The following conditions were assumed where applicable: 20°F average daily temperature change; white tanks, welded construction, wind velocity assumed to be 4 mph for internal floating roof; 25 percent of calculated standing loss assumed as an adjustment for double seals. The assumption of windage loss is conservative since all IFR tanks are nitrogen blanketed and, theoretically, windage loss would be zero.

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TABLE IV-A
LOADING HYDROCARBON EMISSION ESTIMATES FOR THE
PROPOSED LINEAR ALKYL BENZENE UNIT

<u>Item</u>	<u>MW</u>	<u>Quantity, Bbls/Yr</u>	<u>Vapor Pressure, psig</u>	<u>Temp, °F</u>	<u>Emissions, Tons/Yr</u>
N-550L LAB (Barge)	243	125,000	2×10^{-5}	73	<0.01
N-550L LAB	243	125,000	2×10^{-5}	73	<0.01
N-600L LAB	264	250,000	7×10^{-6}	73	<0.01
C _{10/11} Paraffins	149	50,000	1.3×10^{-2}	73	0.07
C ₁₅₊ Paraffins	204	90,000	3×10^{-4}	73	<0.01
N-550L LMR	400	19,000	1×10^{-6}	73	<0.01
N-600L LMR	400	19,000	1×10^{-6}	73	<0.01
DPA	310	24,000	1×10^{-6}	73	<0.01
Total					0.07

- (1) Loading losses were calculated using procedures in Section 4.4 of Supplement 7 to Public Health Service Publication 999-AP-42. All loading is assumed to be tank cars or tank trucks unless otherwise noted. Saturation factors used are from Table 4.4-1 as follows:

Barge Loading	0.5
Tank Car Loading	1.45

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TABLE IV-B

FUGITIVE HYDROCARBON EMISSIONS ESTIMATES FOR PROPOSED LINEAR ALKYL BENZENE UNIT

<u>Fugitive Source</u>	<u>Determinate</u>	<u>Applicable Emissions Factor from AP-42 or EPA-600</u>	<u>Emissions Factor Used</u>	<u>Hydrocarbon Emissions, Tons/Year(3)</u>
Valves				
Gas Vapor Service	80	0.047 Lbs/Hr-Source(2)	0.047 Lbs/Hr-Source(2)	14.9
Light Liquid Service	90	0.023 Lbs/Hr-Source(2)	0.023 Lbs/Hr-Source(2)	8.2
Heavy Liquid Service	630	0.0007 Lbs/Hr-Source(2)	0.0007 Lbs/Hr-Source(2)	1.7
Flanges(5)	3,000	0.00058 Lbs/Hr-Source(2)	0.00058 Lbs/Hr-Source(2)	6.9
Pump Seals	26	0.045 Lbs/Hr-Source(2)	0.045 Lbs/Hr-Source(2)	4.6
Process Drains				
Heavy Liquid	15	0.029 Lbs/Hr-Source(2)	0.029 Lbs/Hr-Source(2)	1.7
Cooling Tower	1,835 x 10 ⁶ Gals/Year	6 Lbs/10 ⁶ Gallons Uncontrolled(1)	0.9 Lbs/10 ⁶ Gallons Controlled(4)	0.8
Total Emissions				38.8

- (1) Emission factor from Table 9.1-2 of Supplement 8 to AP-42 dated December 1977.
- (2) Emission factor from Table 4-2 of EPA-600/2-79-044, February 1979.
- (3) Estimated emissions based on applicable emission factor and 7,920 operating hours per year.
- (4) Fifteen percent of the uncontrolled AP-42 factor based on 85 percent of process duty is seal-welded exchangers with continuous leak detection.
- (5) Flange count assumes each valve has three flanges.

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TABLE IV-C
TRANSIT HYDROCARBON EMISSION ESTIMATES FOR THE
PROPOSED LINEAR ALKYL BENZENE UNIT

<u>Material Transported</u>	<u>Method Transported (1)</u>	<u>Annual Quantity Transported, 10³ Gals</u>	<u>Average Transit Time, Days (2)</u>	<u>LT(3)</u>	<u>Emissions, Tons/Year</u>
N-550L LAB	TC, TT, B	10,500	7	1.44×10^{-5}	<0.01
N-600L LAB	TC, TT	10,500	7	5.00×10^{-6}	<0.01
C _{10/11} Paraffins	TC, TT	2,100	7	8.11×10^{-3}	<0.01
C ₁₅₊ Paraffins	TC, TT	3,780	7	1.92×10^{-4}	<0.01
N-550L LMR	TC, TT	798	7	7.4×10^{-7}	<0.01
N-600L LMR	TC, TT	790	7	7.4×10^{-7}	<0.01
OPA	TC, TT	1,008	7	7.4×10^{-7}	<0.01
Benzene	B	7,128	3	1.25	<u>1.91</u>
Total					1.91

- (1) TC = Tankcar
 TT = Tank Truck
 B = Barge
- (2) Estimated average time in transit for one-way trip to customer. For benzene, this is the estimated one-way trip time from the Houston area to the Lake Charles area.
- (3) LT = Transit emission factor loss in pounds per week per 10³ gallons transported. Calculated from equation (2), page 44-7, of Supplement 7 to AP-42.

$$L_T = 0.1 \text{ PW}$$

where: P = Vapor Pressure, psia
 W = Density of Condensed Vapors, Lbs/Gal

TABLE VI
HYDROCARBON EMISSIONS SUMMARY

<u>Source</u>	<u>Emissions, Tons/Year</u>
Fired Heaters	2.64
Flare	0.07
Storage Tanks (Cone Roof and Floating Roof)	3.63
Loading	0.07
LV-1	1.30
LV-2	<u>0.11</u>
Total Fixed Source	7.82
Total Fugitive Emissions	38.80
Total Transit Emissions	1.91

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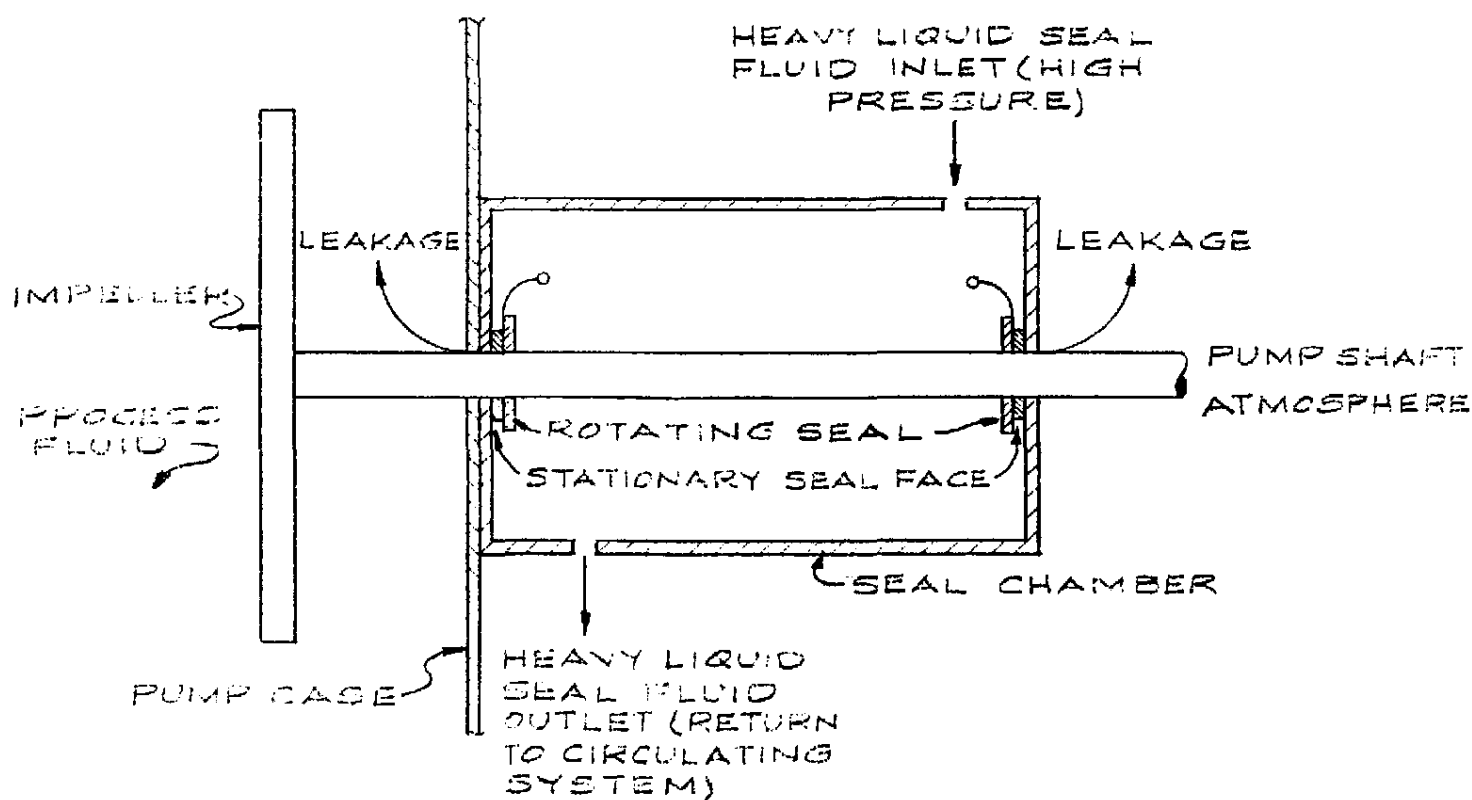


FIGURE 1
SCHEMATIC FLOW DIAGRAM
BENZENE PUMP DOUBLE MECHANICAL SEAL SYSTEM

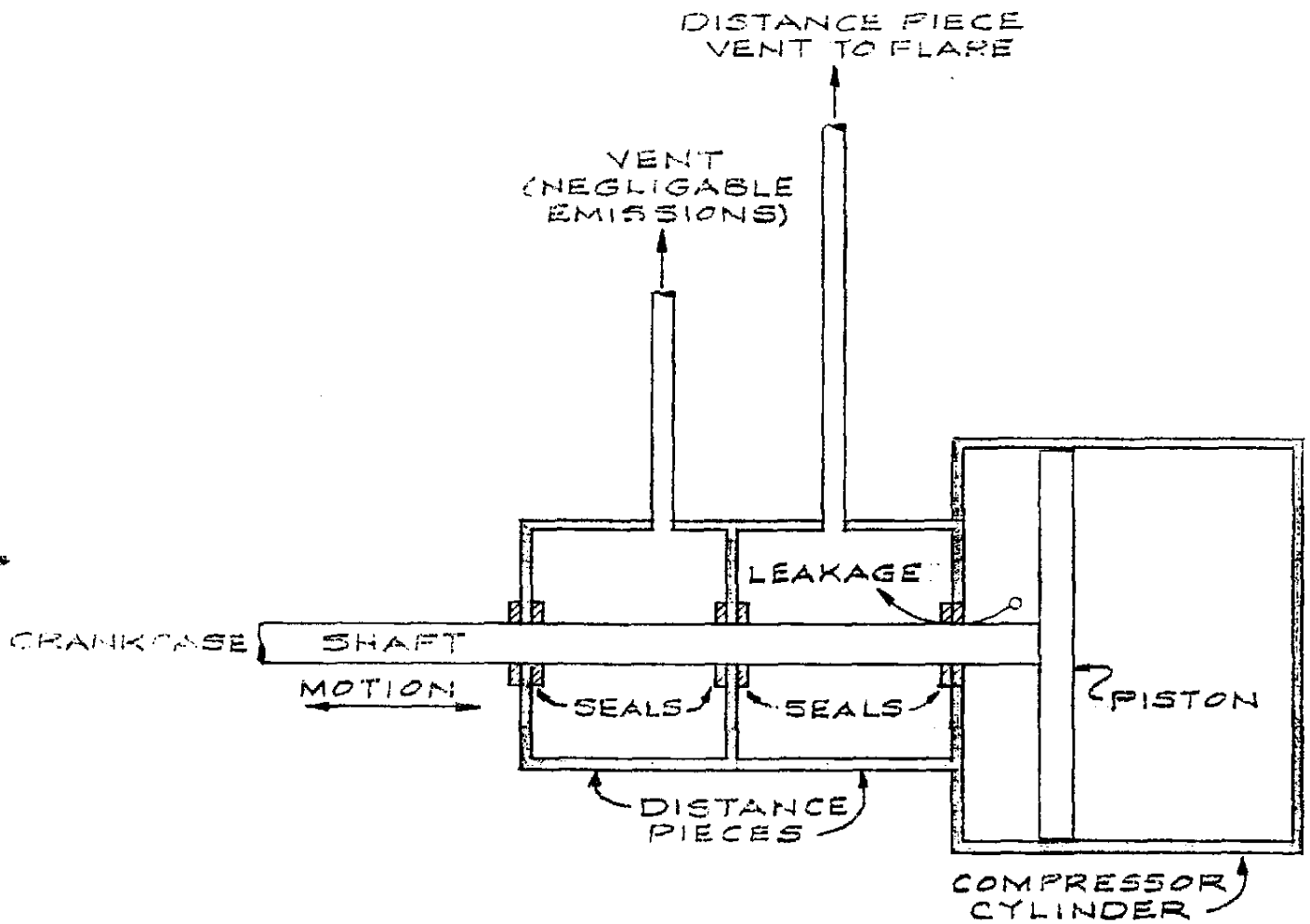


FIGURE 2
SCHEMATIC FLOW DIAGRAM
HYDROGEN COMPRESSOR DUAL DISTANCE
PIECE VENTING

WCD 000008682

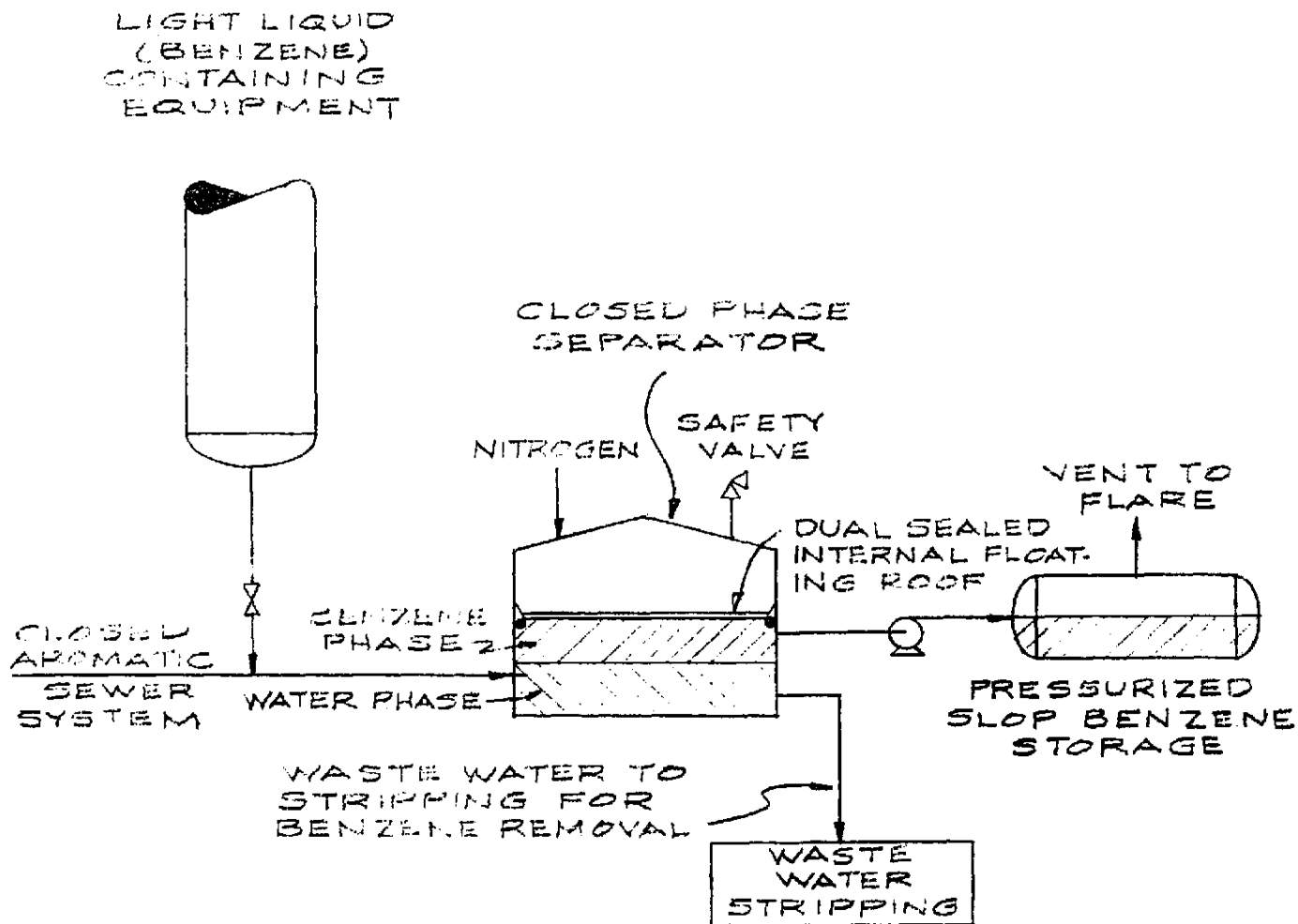


FIGURE 3
SCHEMATIC FLOW DIAGRAM
CLOSED LIGHT LIQUID DRAIN SYSTEM

MOO 000008883

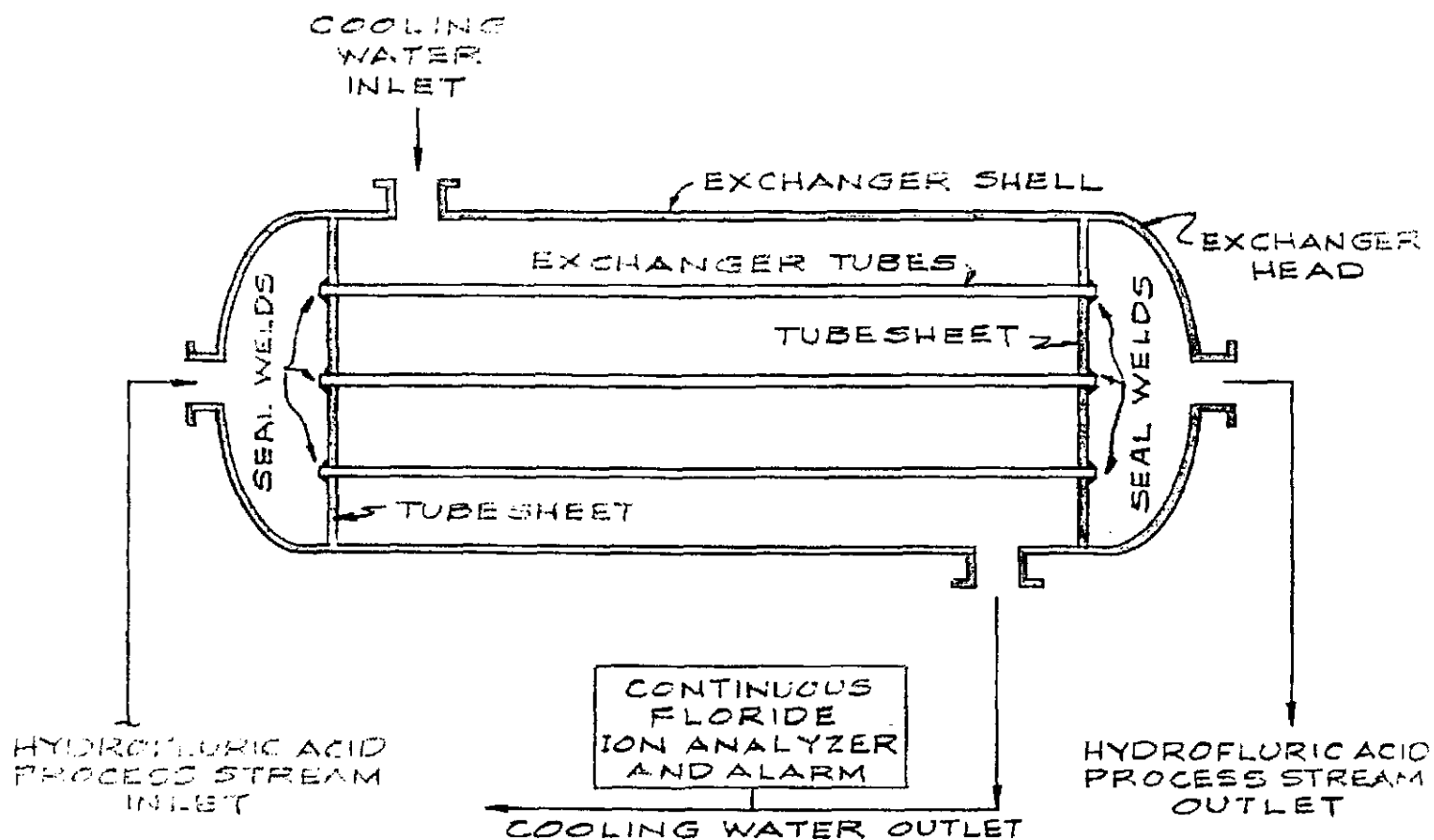


FIGURE 4
SCHEMATIC FLOW DIAGRAM
SEAL WELDED HF EXCHANGERS

MCD 000008884

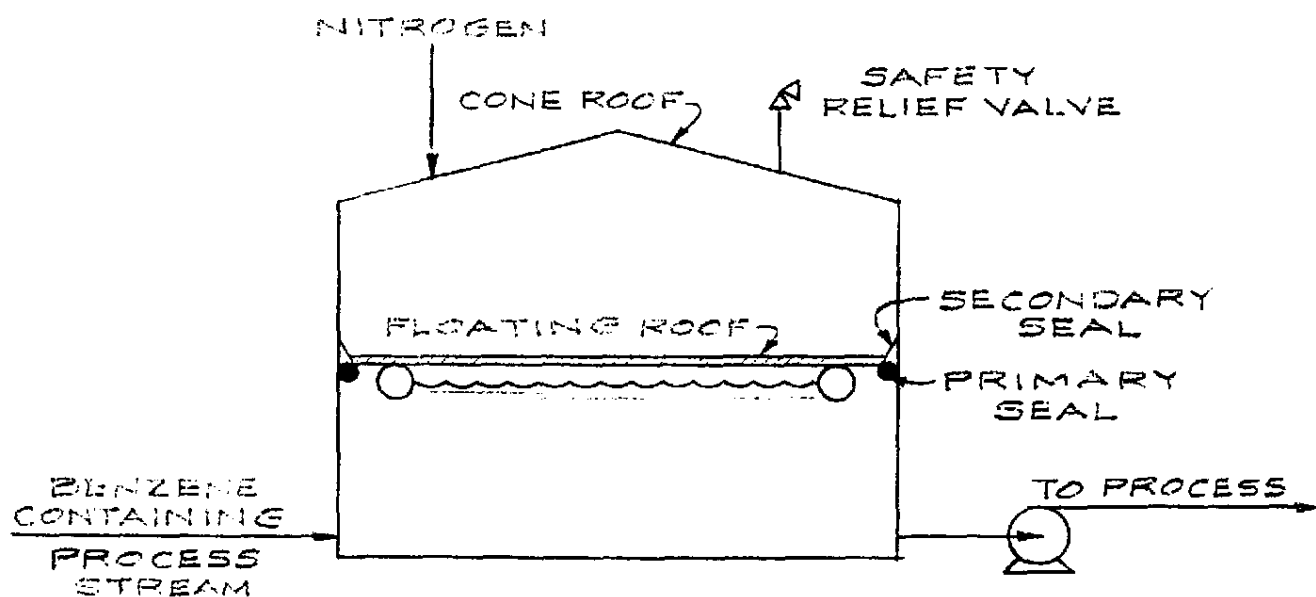


FIGURE 5
SCHEMATIC FLOW DIAGRAM
DOUBLE SEALED INTERNAL FLOATING
ROOF TANK IN BENZENE SERVICE

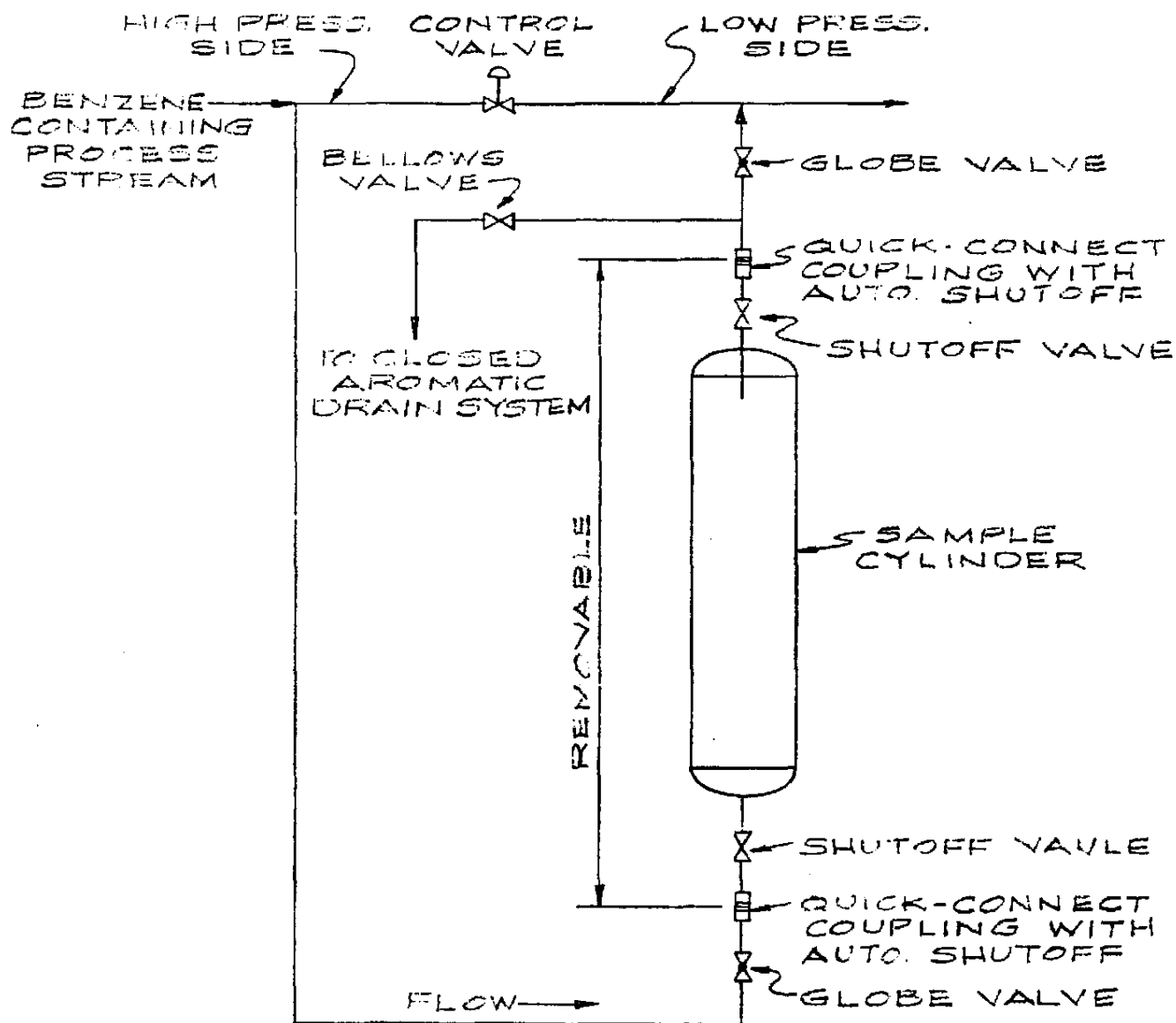


FIGURE 6
SCHEMATIC FLOW DIAGRAM
CLOSED LOOP BENZENE SAMPLING SYSTEM

MCD 000008886