Table "B"

DATA FOR DETERMINING EMISSIONS FROM MARINE ACTIVITY

Described herein are the following lists of fuel usage rates and emission factors for calculating marine activity emissions.

List B-1 Tanker Fuel Usage Rates

List B-2 Diesel Fuel Used During Barge Unloading

List B-3 Tug Usages

List B-4 Fuel Combustion Emission Factors

List B-5 Hydrocarbon Emissions from Onloading of Crude Oil, Ballast, or Products

The methodology, assumptions, and procedures to be used in calculating the emissions shall be consistent with those set forth in Tosco's submittal entitled, "Procedures for Determining Emissions from Marine Activity," dated 10/30/81.

Calculated emissions shall be reported in units of short tons (2,000 lbs avoirdupois) rounded to three (3) significant figures.

LIST B-1: TANKER FUEL USAGE RATES

TANKER DEADWEIGHT TONNAGE	a MAIN ENGINE TYPE	b ENGINE FUEL TYPE	c ENGINE FUEL USE, B/HR	d UNLOADING RATE, B/HR	d BOILER FUEL USE FOR UNLOADING, B/HR	HOTELING FUEL USE: FUEL OIL (F) B/HR	HOTELING FUEL USE: DIESEL OIL (D) B/HR
< 20,000	ST	F	5.0	6,000	7.0	1	0
	MT	D	2.5	6,000	7.0	1	1
20,000 - 29,999	ST	F	8.1	8,000	9.5	1	0
	MT	D	5.6	8,000	9.5	1	1
30,000 - 39,999	ST	F	9.4	10,000	11.5	1	0
	MT	D	6.9	10,000	11.5	1	1
40,000 - 49,999	ST	F	10.9	12,000	13.5	1	0
	MT	D	8.1	12,000	13.5	1	1
50,000 - 59,999	ST	F	13.1	14,000	15.5	1	0
	MT	D	8.4	14,000	15.5	1	1
60,000 - 79,999	ST	F	15.0	15,000	16.0	2	0
	MT	D	9.4	15,000	16.0	2	2
80,000 - 99,999	ST	F	18.1	16,000	17.0	2	0
	MT	D	10.9	16,000	17.0	2	2
100,000 - 139,999	ST	F	20.0	17,000	17.5	2	0
	MT	D	13.1	17,000	17.5	2	2
140,000 - 179,999	ST	F	21.6	18,000	18.5	2	0
	MT	D	15.6	18,000	18.5	2	2
≥ 180,000	ST	F	22.5	19,000	19.5	3	0
	MT	D	19.1	19,000	19.5	3	3

a ST = STEAMSHIP (Steam Boilers and Turbines)
MT = MOTORSHIP (Internal Combustion Engines)

b F = Fuel Oil
D = Diesel Oil

c Barrels per hour (B/HR) of fuel used during transit (at 50% of full steaming)

d During unloading of oil or ballast, steamships and motorships use fuel oil (F) for boilers/turbines which drive the unloading pumps

LIST B-2

DIESEL FUEL USED DURING BARGE UNLOADING*

BARGE UNLOADING RATE (B/HR)	DIESEL FUEL USAGE (B/HR)
2,000	
2,200	
2,500	
3,500	
8,000	
10,000	11.5
13,000	13.5

* It was assumed that the internal combustion engines driving the unloading pumps on the barges used the same diesel as the tugs (i.e., 0.50 w % sulfur, 35 °API).

LIST B-3

TUG USAGES

- One tug for assisting tankers of $< 50{,}000$ DWT size, for a total transit time of four hours per tanker call at docks.
- Two tugs for assisting tankers of $\geq 50{,}000$ DWT size, for a total transit time of four hours each tug per tanker call at docks.
- One tug for transporting barges or lighters, for a total transit time of ten hours per each barge/lighter call at docks.

Thus, for each call below:

	TOTAL TUG TRANSIT HOURS
Tanker of $< 50{,}000$ DWT	4
Tanker of $\geq 50{,}000$ DWT	8
Product shipment barge	10
Crude oil lighter	10

LIST B-4

FUEL COMBUSTION EMISSION FACTORS (Pounds/1,000 gallons of fuel burned)

	FUEL TYPE (a)	HC (b)	SO2	NOx	CO	PM (c)
BOILERS IN STEAMSHIPS:						
During transit	F	3.10	315.3	48.2	2.62	19.0
During hoteling	F	3.10	315.3	20.9	2.62	19.0
During unloading	F	3.10	315.3	48.2	2.62	19.0
IC (d) ENGINES IN MOTORSHIPS:						
During transit	D	32.8	70.1 (f)	367.0	56.9	20.0
During hoteling	D	32.8	70.1 (f)	367.0	56.9	20.0
BOILERS IN MOTORSHIPS:						
During hoteling	F	3.10	315.3	20.9	2.62	19.0
During unloading	F	3.10	315.3	48.2	2.62	19.0
IC (d) ENGINES IN TUGS:						
During transit (e)	TD	13.0	70.1	571.2	56.9	25.0

(a) F = Fuel oil (or residuum) = 2.0 w % Sulfur, 0.43w % Nitrogen, 18 °API
D = Marine diesel = 0.5 w % Sulfur, 0.08 w % Nitrogen, 35 °API
TD = Tug diesel = 0.50 w % Sulfur, 35 °API

(b) HC = Hydrocarbons (or TOG)

(c) PM = Particulate matter

(d) Internal Combustion (IC) Engines

(e) These factors assumed to apply also for the IC engines driving the unloading pumps in barges

(f) For motorships 100,000 DWT or greater, use SO2 factor of 210.3 pounds/1,000 gallons

LIST

HYDROCARBON EMISSIONS FROM ONLOADING OF CRUDE OIL, BALLAST OR PRODUCTS

COMMODITY	HYDROCARBON EMISSIONS (LBS/1,000 GALLONS OF COMMODITY)
Crude Oil	1.7 (Barges) 1.0 (Vessels)
Ballast (unsegregated)*	0.7 (Crude) 1.6 (Gasoline)
Gasoline	4.0 (Barge) 2.4 (Vessel)
Turbine Fuel (Jet Fuel)	0.005
Diesel Oil	0.005
Conversion Feed, Gas Oil, Cutter Stock, Catalytic Cracker Charge, HDN Charge, Stove Oil, Solvents, Lubestocks, MDO	0.005
Fuel Oil, Heavy Fuel Oil, Low Sulfur Fuel Oil, Bunkers, IFO, LSFO, Resid, Carbon Black, Purchased Cut Back Tar, Asphalt	0.00004

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* The volume of unsegregated ballast taken on by a ship which has offloaded cargo is determined by the following equation:

$$B = 7.5 \times MDWT \times \left(0.35 - \frac{B_{segregated}}{100}\right)$$

Where: B = The volume ballasted into dirty cargo tanks in MBBL.

MDWT = Ship tonnage in thousands of dead weight tons as indicated by Clarkson.

$B_{segregated}$ = The percent of segregated or dedicated ballast for the ship as indicated by Clarkson or some other reliable source which is known to be more current; e.g., ship's records, where the percent is equal to or less than 35. If the percent is greater than 35 the amount of unsegregated ballast will be zero.

t Related Fugitive NM[illegible] Emissions

Process Unit/Fugitive Source Category	Quantity(1)	Emissions(2) (lbs/d[illegible]
No. 3 HDS Unit		
Compressor Seals - H_2 Service (to atmosphere)[3]	4	3
Compressor Seals - H_2 Service (to blowdown)	2	-0-
Pump Seals - Light HC Service (double seals)	4	4
Pump Seals - Heavy HC Service	16	18
Valves - HC Gas Service (3)	25	14
Valves - H_2 Gas Service (3)	150	26
Valves - Light HC Liquid Service (3)	220	51
Valves - Heavy HC Liquid Service (3)	655	3
Valves - Relief to atmosphere (3)	7	13
Valves - Relief to blowdown	25	-0-
Flanges	2164	29
New Process Drains	76	
Waste Water (gallons/min)	100	
No. 3 HDS Cooling Tower (10^6 gal/day)	8.6	6
Hydrogen Recovery Unit		
Compressor Seals - H_2 Service (to blowdown)	3	-0-
Valves - H_2 Gas Service (3)	20	3
Valves - Relief (to atmosphere)	-0-	-0-
Valves - Relief (to blowdown)	10	-0-
Flanges	60	1
Merox Unit		
Pump Seals - Light HC Service (double seals)	2	
Valves - Light HC Liquid Service (3)	100	2
Valves - Relief (to atmosphere)	-0-	-[illegible]-
Valves - Relief (to blowdown)	2	-[illegible]-
Flanges	204	
Air Bleed (to atmosphere)	1	
Flare System Modification		
Compressor Seals - H_2 Service (to blowdown	4	-0-
Pump Seals - Light HC Service (double seals)	1	
Valves - H_2 Gas Service (3)	7	1
Valves - Light HC Liquid Service (3)	5	1
Valves - Relief (to atmosphere)	-0-	-0-
Valves - Relief (to blowdown)	-0-	-0-
Flanges	2[illegible]	(*)

Process Unit/Fugitive Source Category	Quantity(1)	Emissions(2) (lbs/da
No. 4 Gas Plant Modification		
Pump Seals - Light HC Service (double seals)	8	9
Pump Seals - Light HC Service (single seals)	(8)	(48)
Pump Seals - Heavy HC Service	1	1
Valves - Light HC Liquid Service (3)	100	23
Valves - Relief (to atmosphere) (3)	(1)	(2)
Valves - Relief (to blowdown)	-0-	-0-
Flanges	198	3
No. 1 Gas Plant		
Compressor Seals - HC Service (to blowdown)[4]	(12)	(54)

(1) Numbers in parentheses represent reductions.
(2) Rounded off to the nearest 1 lb/day. Numbers in parentheses represent reductions.
(3) Emission calculations include reduction for inspection/maintenance housekeeping program.
(4) Unit has three compressors, each with 4 seals. Emission calculati based on Note (3) and an average of 1.5 compressors in operation a any one time.
(*) De minimis