

USED OIL BURNED AS A FUEL

Volume I

AP42 Section 1.4

4/93

reference 4

Note: This is a reference cited in AP 42, *Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources*. AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

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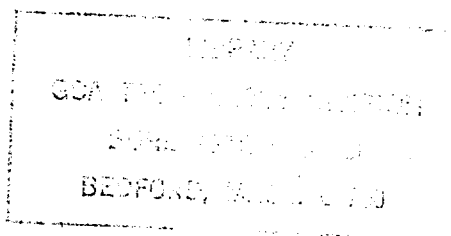


Table 7-15. PARTICULATE EMISSIONS-RECON TESTS

Fuel	Run No.	% Ash	Sample No.	Dry Gas Composition % by Vol.			Avg. % O ₂	Gas Vol. correction to zero xs air*	Avg. Emissions grains/dscf†	Emissions Corrected to zero xs air grains/dscf	Ratio of Ac To Calc. Emissions From
				CO ₂	O ₂	N ₂					
#2 Fuel Oil (FO)	1	0.02	1	7.5	12.5	80.0	13.0	0.3812	0.0179	0.047	>>1
	2		2	7.0	13.5	79.5					
15-25% Ind. WO in FO	2	0.13	1	7.0	14.0	79.0	11.0	0.4764	0.0329	0.069	>>1
	2		2								
	3		3	11.0	8.0	81.0					
8% Crankcase Oil in FO	3	0.04	1	9.0	10.0	81.0	10.0	0.5240	0.0310	0.059	>>1
	2		2								
	3		3								
#6 Fuel Oil (FO)	4	0.01	1	12.0	12.0	76.0	9.8	0.5335	0.0062	0.012	>>1
	2		2								
	3		3	11.5	7.5	81.0					
9.72% Crankcase Oil in FO	5	0.09	1	11.0	7.2	81.8	6.6	0.6858	0.0139	0.020	1.32
	2		2								
	3		3	11.5	6.0	82.5					
60.4% Crankcase Oil in FO	6	0.48	1	9.5	8.5	82.0	7.5	0.6430	0.0476	0.074	0.63
	2		2	8.0	8.0	84.0					
	3		3	10.0	6.0	84.0					
20.8% Reproc. Oil in FO	7	0.20	1	9.75	7.0	83.25	5.3	0.7477	0.0283	0.038	1.09
	2		2	11.0	5.0	84.0					
	3		3	7.5	4.0	88.5					
100% Reprocessed Oil	8	0.91	1	8.5	5.5	86.0	6.0	0.7144	0.0841	0.118	0.50
	2		2	9.0	6.5	84.5					
	3		3								
20.6% Inc. WO in FO	9	0.05	1	11.4	6.0	82.6	5.8	0.7239	0.0145	0.020	2.05
	2		2								
	3		3	7.0	5.5	87.5					

*Correction = $[100 - (\%O_2)(4.76)]/100$

†filter catch only - EPA Method 5

Table 7-14

SO₂ AND NO_x EMISSIONS DURING RECON TESTS

RUN NO.	FUEL		SO ₂			NO		
	GPH	% S	grams/ hr S	SO ₂ /hr	lbs SO ₂ / 10 ³ gal	grams/ hr N	NO ₂ /hr	lbs NO ₂ / 10 ³ gal
1 (#2 Oil)	33.0	0.16	232	1.021	30.9	52	0.376	11.4
2	30.6	0.17	148	0.651	21.3	52	0.376	12.3
3	12.8	0.25	95	0.418	32.7	35	0.253	19.8
4 (#6 Oil)	140	0.30	1595	7.020	50.1	440	3.184	22.7
5	134	0.31	1187	5.224	39.0	506	3.662	27.3
6	142	0.35	1517	6.677	47.0	351	2.540	17.9
7	136	0.31	1639	7.214	53.0	309	2.236	16.4
8	131	0.36	1939	8.534	65.1	343	2.482	18.9
9	133	0.27	1336	5.880	44.2	385	2.786	20.9

* Emission factor from Table 4-1.

Fuel Analyses For Site A

Sample No.	78-33	78-34	78-44
	Test No. 1 Fuel	Test No. 2 Fuel	Untreated
	#2 Fuel Oil	#2 Fuel/Industrial	Industrial
		Used Oil	Used Oil
GRAVITY, API @60°F	33.6	31.1	—
FLASH POINT, COC	164°F	188°F	—
FIRE POINT, COC	182°F	202°F	—
POUR POINT, ASTM	MINUS 10°F	MINUS 40°F	—
CARBON RES., CON.	0.05%	0.50%	—
SULFUR, ASTM	0.16%	0.17%	—
WATER & SEDIMENT	NIL	1.0%	TOO WET
B.T.U. PER POUND	19662	19764	90.0%
B.T.U. PER GALLON	140308	143209	—
NICKEL	1 PPM	1 PPM	—
ACID NUMBER	0.04 MGKO/GR.	0.35 MGKOM/GR	—
NITROGEN	0.22%	0.20%	—
CHLORINE	NIL	NIL	—
ASH	0.02%	0.13%	—
VANADIUM	LESS 1 PPM	LESS 1 PPM	TOO WET
SODIUM	LESS 1 PPM	5 PPM	—
VISC., SU @100°F	34.4 SEC.	47.3 SEC.	—
IRON	LESS 1 PPM	227 PPM	OVER 1000 PPM
LEAD	3 PPM	13 PPM	67 PPM
COPPER	LESS 1 PPM	11 PPM	64 PPM
CHROMIUM	LESS 1 PPM	LESS 1 PPM	6 PPM
ALUMINIUM	LESS 1 PPM	5 PPM	22 PPM
NICKEL	LESS 1 PPM	LESS 1 PPM	3 PPM
SILVER	LESS 1 PPM	LESS 1 PPM	LESS 1 PPM
TIN	LESS 1 PPM	LESS 1 PPM	11 PPM
SILICA	LESS 1 PPM	29 PPM	145 PPM
BORON	LESS 1 PPM	LESS 1 PPM	3 PPM
SODIUM	LESS 1 PPM	5 PPM	287 PPM
PHOSPHOROUS	LESS 1 PPM	90 PPM	360 PPM
ZINC	LESS 1 PPM	LESS 1 PPM	150 PPM
CALCIUM	LESS 1 PPM	140 PPM	1350 PPM
BARIUM	LESS 1 PPM	LESS 1 PPM	10 PPM
MAGNESIUM	LESS 1 PPM	LESS 1 PPM	10 PPM

Table 2

Fuel Analyses for Site C

Sample No.	78-133	78-134	78-135	78-136
Description	#6 Fuel Oil	Crankcase Oil	Reprocessed Oil	Industrial Waste Oil
Test No.	4	*	8 ⁺	#
Gravity, API @ 60°F	28.3, ⁸⁹⁶	28.1, ⁸⁹⁸	28.7, ⁸⁹⁴	27.4
Fire Point, COC	310°F		320°F	470°F
Flash Point, COC	285°F	**	300°F	435°F
Visc., SU @ 100°F	189 sec.		214 sec.	Drips
Visc., SF @ 122°F		18.7 sec.		21.1 sec.
Pour Point, ASTM minus 30°F	minus 30°F	minus 30°F	minus 30°F	minus 25°F
Carbon Res., Con.	1.05%	1.70%	1.61%	0.19%
Sulfur, ASTM	0.30%	0.39%	0.36%	0.14%
Water & Sediment	0.1%	8.0%	0.5%	8.0%
A.T.U. per pound	19312	17541	19140	18269
A.T.U. per gallon	144012	131139	142555	135468
Acid number,				
MGKOH/GRAM	0.11	2.44	2.02	0.93
Nitrogen	less 0.01%	less 0.01%	less 0.01%	less 0.01%
Chloride	none found	0.34%	trace	2.01%
Ash	0.01%	0.79%	0.91%	0.22%
Vanadium	18 ppm	less 1 ppm	less 1 ppm	less 1 ppm
Sodium	21 ppm	84 ppm	297 ppm	11 ppm
Iron	2 ppm	91 ppm	152 ppm	12 ppm
Lead	2 ppm	2310 ppm	627 ppm	less 5 ppm
Copper	1 ppm	63 ppm	55 ppm	10 ppm
Chromium	1 ppm	4 ppm	11 ppm	less 1 ppm
Aluminium	4 ppm	13 ppm	27 ppm	less 1 ppm
Nickel	4 ppm	1 ppm	4 ppm	less 1 ppm
Silver	1 ppm	nil	nil	nil
Zinc	4 ppm	5 ppm	10 ppm	less 5 ppm
Silica	less 1 ppm	2 ppm	32 ppm	4 ppm
Boron	11 ppm	3 ppm	37 ppm	9 ppm
Sodium	2 ppm	100 ppm	300 ppm	3 ppm
Phosphorous	40 ppm	466 ppm	520 ppm	16 ppm
Cadmium	6 ppm	171 ppm	252 ppm	140 ppm
Calcium	5 ppm	620 ppm	960 ppm	30 ppm
Barium	less 50 ppm	80 ppm	160 ppm	less 50 ppm
Magnesium	4 ppm	143 ppm	356 ppm	6 ppm

* Starts to boil at 200°F.

* Used in mixture with #6 fuel oil in test nos. 5 and 6.

* Also used in mixture with #6 fuel oil in test no. 7.

* Used in mixture with #6 fuel oil in test no. 9.