A01-E21 - Engine, Natural Gas Fired, 4 Cycle Lean Burn with SCR-Oxidation Catalyst

CALCULATION METHODS

Ea = Ua x EF (lbs/mmft3)

Eh = Uh (scfm) x (60/1000000) x EF (lbs/mmft3)

NOTES:

- SCR can achieve efficiencies as high as 90% in reducing of NOx.

- Catalytic oxidation can achieve efficiencies of approximately 90% in reducing of CO, ROG, TOG, and AB2588 toxic organic compounds.

- The trace organic factors listed below are based on detected AB 2588 compounds listed in AP-42 Table 3.2-2 (7/00).

- The AP-42 (7/00) emission factors have been converted into lbs/mmscf by assuming a natural gas BTU content of 1020 BTU/scf.

- PM10 and TSP emission factors include filterable and condensable PM in accordance with the District's definition of particulate matter.

- The listed AP-42 emission factors for 2-methylnaphthalene (PAH), acenaphthalene (PAH), acenaphthylene (PAH), benzo(a)pyrene (PAH), benzo(b)fluoranthene (PAH), benzo(g,h,i)perylene (PAH), chrysene (PAH POM), fluoranthene (PAH POM), fluorene (PAH POM), phenanthrene (PAH POM), and pyrene (PAH POM) are NOT included since these values were based on insignificant and/or nondetectable test results.

- Trace metal emission factors were not reported in AP-42 and are NOT included since natural gas fired engines are not expected to emit metals.

- The AP-42 emission factors for butane, cyclopentane, ethane, isobutane, methylcyclohexane, n-nonane, n-octane, n-pentane, and propane, and tetrachloroethane are not included since these are not listed toxic air contaminants.

- The AP-42 acrolein emission factor is NOT included since this value is based on test data and detection limits from incorrect sampling methods. A District factor based on local test results and adjusted for equipment VOC controls is considered more accurate than the AP-42 value.

- SCR controls create ammonia / ammonium hydroxide emissions which are considered PM10 by the District's definition. The PM factors below do NOT include ammonia slip. Site specific emission estimates should be quantified as ammonium hydroxide and added to the PM default PM factors where TSP and PM10 (filterable and condensible) data does not exist.

Pollutant	District Emission Factor (lbs/million ft3 fuel burned)	EPA Reference Document	EPA Factor	Units	Comments
NOx	416.16	AP-42, Sect 3.2, 7/00, Table 3.2-2	4.08E-01	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
CO	32.33	AP-42, Sect 3.2, 7/00, Table 3.2-2	3.17E-02	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
SOx	0.60	AP-42, Sect 3.2, 7/00, Table 3.2-2	5.88E-04	lbs/MMBTU	Assume a sulfur content of 0.05% and a fuel density of 7 lbs/gal
TOG	149.94	AP-42, Sect 3.2, 7/00, Table 3.2-2	1.47E-01	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
ROG	12.04	AP-42, Sect 3.2, 7/00, Table 3.2-2	1.18E-02	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
TSP	10.19	AP-42, Sect 3.2, 7/00, Table 3.2-2	9.99E-03	lbs/MMBTU	TSP includes filterable (7.71 E-05) and condensable (9.91 E-03) PM.
PM10	10.19	AP-42, Sect 3.2, 7/00, Table 3.2-2	9.99E-03	lbs/MMBTU	PM10 includes filterable (7.71 E-05) and condensable (9.91 E-03) PM.
1,1,2,2-Tetrachloroethane	0.004	AP-42, Sect 3.2, 7/00, Table 3.2-2	4.00E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
1,1,2-Trichloroethane	0.003	AP-42, Sect 3.2, 7/00, Table 3.2-2	3.18E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
1,1-Dichloroethane	0.002	AP-42, Sect 3.2, 7/00, Table 3.2-2	2.36E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2

1,2,3-Trimethylbenzene	0.002	AP-42, Sect 3.2, 7/00, Table 3.2-2	2.30E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
1,2,4-Trimethylbenzene	0.001	AP-42, Sect 3.2, 7/00, Table 3.2-2	1.43E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
1,2-Dichloroethane	0.002	AP-42, Sect 3.2, 7/00, Table 3.2-2	2.36E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
1,2-Dichloropropane	0.002	AP-42, Sect 3.2, 7/00, Table 3.2-2	2.69E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
1,3,5-Trimethylbenzene	0.0034	AP-42, Sect 3.2, 7/00, Table 3.2-2	3.38E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
1,3-Butadiene	0.03	AP-42, Sect 3.2, 7/00, Table 3.2-2	2.67E-05	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
1,3-Dichloropropene	0.002	AP-42, Sect 3.2, 7/00, Table 3.2-2	2.64E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
2,2,4-Trimethylpentane	0.03	AP-42, Sect 3.2, 7/00, Table 3.2-2	2.50E-05	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Acetaldehyde	0.85	AP-42, Sect 3.2, 7/00, Table 3.2-2	8.36E-04	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Acrolein	0.01	AP-42, Sect 3.2, 7/00, Table 3.2-2		lbs/MMBTU	Emission factor is based on San Diego APCD test results. Assumes 70% control efficiency. AP-42 Secs 3.1.3.5 & 3.1.4.3
Ammonia					Use site specific ammonia slip test results to estimate these emissions.
Benzene	0.04	AP-42, Sect 3.2, 7/00, Table 3.2-2	4.40E-05	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Biphenyl [POM	0.02	AP-42, Sect 3.2, 7/00, Table 3.2-2	2.12E-05	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Carbon Tetrachloride	0.004	AP-42, Sect 3.2, 7/00, Table 3.2-2	3.67E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Chlorobenzene	0.003	AP-42, Sect 3.2, 7/00, Table 3.2-2	3.04E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Chloroform	0.003	AP-42, Sect 3.2, 7/00, Table 3.2-2	2.85E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Chloroethane	0.0002	AP-42, Sect 3.2, 7/00, Table 3.2-2	1.87E-07	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Ethylbenzene	0.004	AP-42, Sect 3.2, 7/00, Table 3.2-2	3.97E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Ethylene Dibromide	0.005	AP-42, Sect 3.2, 7/00, Table 3.2-2	4.43E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Formaldehyde	5.39	AP-42, Sect 3.2, 7/00, Table 3.2-2	5.28E-03	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Hexane	0.11	AP-42, Sect 3.2, 7/00, Table 3.2-2	1.11E-04	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Isobutyraldehyde	0.01	AP-42, Sect 3.2, 7/00, Table 3.2-2	1.01E-05	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Methane	127.50	AP-42, Sect 3.2, 7/00, Table 3.2-2	1.25E-01	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Methanol	0.26	AP-42, Sect 3.2, 7/00, Table 3.2-2	2.50E-04	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Methylene Chloride	0.002	AP-42, Sect 3.2, 7/00, Table 3.2-2	2.00E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Naphthalene	0.007	AP-42, Sect 3.2, 7/00, Table 3.2-2	7.44E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
PAH	0.003	AP-42, Sect 3.2, 7/00, Table 3.2-2	2.69E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Phenol	0.002	AP-42, Sect 3.2, 7/00, Table 3.2-2	2.40E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Styrene	0.002	AP-42, Sect 3.2, 7/00, Table 3.2-2	2.36E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Toluene	0.04	AP-42, Sect 3.2, 7/00, Table 3.2-2	4.08E-05	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Vinyl Chloride	0.002	AP-42, Sect 3.2, 7/00, Table 3.2-2	1.49E-06	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2
Xylenes (Mixed)	0.01	AP-42, Sect 3.2, 7/00, Table 3.2-2	1.84E-05	lbs/MMBTU	Assumes 90% control efficiency. AP-42 Sec 3.2.4.2

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