Table A-1
Plantwide GHG Emission Summary
Formosa Plastic Corporation, Texas
Olefins Expansion
May 2014

Name	EPN(s)	GHG Mass Emissions [1]	CO_2e [1]
		ton/yr	ton/yr
Cracking Furnace Nos. 1 through 14	OL3-FUR1 through OL3-FUR14	1,462,735	1,464,333
Steam Boiler Nos. 1 through 4	OL3-BOIL1 through OL3-BOIL4	818,869	819,763
PDH Reactor Nos. 1 through 4	PDH-REAC1 through PDH-REAC4	236,501	236,898
Olefins 3 Fugitives [4]	OL3-FUG	4.83	114.8
PDH Fugitives [4]	PDH-FUG	1.17	23.17
Elevated Flare [2]	OL3-FLRA, OL3-FLRB	84,037	85,450
Low Pressure Flare 1 [2]	OL3-LPFLR1	9,184	9,857
Low Pressure Flare 2 [2]	OL3-LPFLR2	9,184	9,857
Decoking Drum 1 [3]	OL3-DK1	329	329
Decoking Drum 2 [3]	OL3-DK2		
MAPD Regenerator Vent [4]	OL3-MAPD	32.8	32.8
PDH Unit MSS Vessel Opening [4]	PDH-MSSVO	3.12	9.21
Olefins 3 Plant MSS Vessel Opening [4]	OL3-MSSVO	2.22	54.7
Olefins 3 Emergency Engine	OL3-GEN	447	449
PDH Emergency Engine	PDH-GEN	447	449
	total =	***2,621,778***	***2,627,618***

Note:
[1] Combustion unit emissions (furnace, boiler, reactors) include emissions from both fuel gas and natural gas combustion. CO2e emissions in units of short (English) tons per year.
[2] Flare emissions include emissions from flare pilot and waste gas combustion.
MSS emissions associated with flares streams are also included in the elevated flare value.
[3] Emissions from furnace decoking may occur from either decoking drum 1 or 2.
[4] FPC TX Requests that No Emission Limit be established for this source.
Compliance will be assured with the design/work practice standard as specified in the permit.

Table A-2
GHG Emission Calculations - Natural Gas Combustion
Formosa Plastic Corporation, Texas
Olefins Expansion
May 2014

GHG Emissions Contribution From Natural Gas Fired Combustion:						Emissions per Unit			
Source Type	**Average Heat Input/Unit (MMBtu/hr)**	**Estimated Hours firing Natural Gas with Remainder Fuel Gas[1] (hrs/yr)**	**Annual Avg Heat Input, Each Unit (MMBtu/yr)**	**Pollutant**	**Emission Factor (kg/MMBtu)[2]**	**GHG Mass Emissions[3] (metric ton/yr)**	**Global Warming Potential[4]**	**CO_2e (metric ton/yr)**	**CO_2e (tpy)**
Pyrolysis Furnaces	220	2,500	550,000	CO_2	53.02	29,161	1	29,161	32,150
				CH_4	1.0E-03	0.55	25	13.75	15.16
				N_2O	1.0E-04	0.06	298	16.39	18.07
					Totals	**29,162**		**29,191**	**32,183**
PDH Unit Reactors	191	1,900	363,000	CO_2	53.02	19,246	1	19,246	21,219
				CH_4	1.0E-03	0.36	25	9.08	10.01
				N_2O	1.0E-04	0.04	298	10.82	11.93
					Totals	**19,247**		**19,266**	**21,241**
Steam Boilers	431	2,500	1,078,000	CO_2	53.02	57,156	1	57,156	63,014
				CH_4	1.0E-03	1.08	25	26.95	29.71
				N_2O	1.0E-04	0.11	298	32.12	35.42
					Totals	**57,157**		**57,215**	**63,079**
Elevated Flare Pilots	0.50	8,760	4,000	CO_2	53.02	212	1	212	234
				CH_4	1.0E-03	4.00E-03	25	0.10	0.11
				N_2O	1.0E-04	4.00E-04	298	0.12	0.13
					Totals	**212.1**		**212**	**234**
Low Pressure Flare Pilots (each)	0.40	8,760	4,000	CO_2	53.02	212	1	212	234
				CH_4	1.0E-03	4.00E-03	25	0.10	0.11
				N_2O	1.0E-04	4.00E-04	298	0.12	0.13
					Totals	**212.1**		**212**	**234**
Total, All Natural Gas Combustion						***105,989***		***106,097***	***116,971***

Notes:

1. These units have the capability of firing natural gas for up to 8760 hours/yr. For purposes of calculating GHG emissions, the hours of natual gas firing (shown here) with remainder fuel gas firing are used. The hours of natural gas firing are not intended to be permit limitations; FPC TX will comply with the GHG emission limits set forth in the permit.

2. CO2 GHG factor from Table C-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting (GHG MRR).
CH4 and N2O GHG factors based on Table C-2 of GHG MRR.

3. CO_2 emissions based on 40 CFR Part 98, Subpart C, Equation C-1.
CH_4 and N_2O emissions based on 40 CFR Part 98, Subpart C, Equation C-8.

4. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

Sample Calculation: Pyrolysis Furnaces - CO_2:

GHG Mass Emissions (metric ton/yr) = 0.001 x 550000 (MMBtu/yr) x 53.02 kg/MMBtu = 29161
CO2e (metric ton/yr) = 29161 (metric ton/yr) x 1 = 29161

Table A-3
GHG Emission Calculations - Fuel Gas Combustion
Formosa Plastic Corporation, Texas
Olefins Expansion
May 2014

Fuel Gas Data:

Variable	Value		Units	Reference
	Olefins 3 Fuel Gas	PDH Unit Fuel Gas		
HHV	522	391	Btu/scf	design specification
Carbon Content (Annual Avg)	0.70	0.363	kg C/kg	design specification
Molecular Weight (Annual Avg)	8.23	6.49	kg/kg-mol	design specification

GHG Emissions Contribution From Fuel Gas Fired Combustion:

Source Type	Fuel Gas Type	Average Heat Input/Unit (MMBtu/hr)	Annual Average Fuel Gas Usage/Unit[1] (MMscf/hr)	Number of Units	Estimated Hours firing Fuel Gas with Remainder Natural Gas[2] (hrs/yr)	Annual Average Fuel Use, Each Unit (scf/yr)	Annual Average Heat Input, Each Unit (MMBtu/yr)	Pollutant	Emission Factor (kg/MMBtu)[3]	Emissions per Unit: GHG Mass Emissions[4] (metric ton/yr)	Global Warming Potential[5]	CO_2e (metric ton/yr)	CO_2e (tpy)
Pyrolysis Furnace	Olefins 3	220	0.421	14	6,260	2.64E+09	1.38E+06	CO_2		65,604	1	65,604	72,329
								CH_4	1.0E-03	1.38	25	34.43	37.96
								N_2O	1.0E-04	0.14	298	41.04	45.25
									Totals	**65,606**		**65,680**	**72,412**
Steam Boilers	Olefins 3	431	0.826	4	6,260	5.17E+09	2.70E+06	CO_2		128,525	1	128,525	141,699
								CH_4	1.0E-03	2.70	25	67.45	74.37
								N_2O	1.0E-04	0.27	298	80.40	88.64
									Totals	**128,528**		**128,673**	**141,862**
PDH Unit reactors	PDH	191	0.488	4	6,860	3.35E+09	1.31E+06	CO_2		34,075	1	34,075	37,568
								CH_4	1.0E-03	1.31	25	33	36
								N_2O	1.0E-04	0.13	298	39	43
									Totals	**34,077**		**34,147**	**37,647**
Total, All Fuel Gas Combustion										***228,210***		***228,500***	***251,921***

Notes:

1. Fuel use calculated as: MMscf/hr = Firing rate (MMBtu/hr) / HHV (Btu/scf)

2. These units have the capability of firing fuel gas for up to 8760 hours/yr. For purposes of calculating GHG emissions, the hours of fuel gas firing (shown here) with remainder natural gas firing are used. The hours of fuel gas firing are not intended to be permit limitations; FPC TX will comply with the GHG emission limits set forth in the permit.

3. CH_4 and N_2O GHG factors based on Table C-2 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.
CH_4 and N_2O emissions based on 40 CFR Part 98, Subpart C, Equation C-8.

4. CO_2 emissions based on 40 CFR Part 98, Subpart C, Equation C-5.

5. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

Sample Calculation: PDH Reactors - CO_2:

GHG Mass Emissions (metric ton/yr) = (44/12) x 3.35E+09 (scf/yr) x 0.363 kg C/kg x 6.49 kg/kg-mol / 849.5 scf/kg-mole @ std cond. x 0.001 = 3.41E+04
CO2e (metric ton/yr) = 3.41E+04 (metric ton/yr) x 1 = 3.41E+04