1.0 EXECUTIVE SUMMARY

MOSTARDI PLATT conducted a compliance dioxin and furan emissions test program for St Marys Cement at the Charlevoix Plant in Charlevoix, Michigan on the Main Kiln Stack. Main Kiln particulate testing was performed during both "mill on" and "mill off" conditions. This report summarizes the results of the test program and test methods. St Marys Cement operates under Michigan Renewable Operating Permit MI-ROP-B1559-2014 and Permit to Install 140-15.

The test locations, test dates, and test parameter are summarized below.

TEST INFORMATION		
Test Locations	**Test Dates**	**Test Parameter**
Main Kiln Stack (Mill On)	April 22, 2021	Dioxin/Furan (D/F)
Main Kiln Stack (Mill Off)	April 20 and 23, 2021	

The purpose of the test program was to demonstrate compliance with Title 40, *Code of Federal Regulations*, Part 60 (40CFR60) and Part 63 (40CFR63) Subpart LLL "*National Emission Standards for Hazardous Air Pollutants (NESHAP) for the Portland Cement Manufacturing Industry and Standards of Performance for Portland Cement Plants.*" Specifically, to demonstrate that each of the below listed sources meet their D/F emission limit.

Test Location	Parameter	Test Method	Emission Limit	Emission Rate
Main Kiln Stack (Mill On)	D/F	USEPA Method 23, 40CFR60, Appendix A	≤ 0.40 ng/dscm @ 7% O_2 (TEQ)	≤ 0.0029
Main Kiln Stack (Mill Off)	D/F			≤ 0.09

The identifications of the individuals associated with the test program are summarized below.

TEST PERSONNEL INFORMATION		
Location	**Address**	**Contact**
Test Facility	St Marys Cement Charlevoix Cement Plant 16000 Bells Bay Road Charlevoix, Michigan 49720	Ms. Laurie Leaman Environmental Manager (231) 237-1387 laurie.leaman@vcimentos.com
Testing Company Supervisor	Mostardi Platt 888 Industrial Drive Elmhurst, Illinois 60126	Mr. Daniel Kossack Project Manager 630-993-2100 (phone) dkossack@mp-mail.com

The test crew consisted of Messrs. J. Carlson, R. Spoolstra and D. Kossack of Mostardi Platt.

2.0 TEST METHODOLOGY

Emission testing was conducted following the United States Environmental Protection Agency (USEPA) methods specified in 40CFR60, Appendix A in addition the Mostardi Platt Quality Manual. Schematics of the test section diagrams and sampling trains used are included in Appendix A and B respectively. Calculation nomenclature are included in Appendix C. Laboratory analysis for each test run are included in Appendix D. The computerized reference method test data is included in Appendix E. CPMS data and process data as provided by St Marys Cement are also included in Appendix F.

The following methodologies were used during the test program:

Method 1 Sample and Velocity Traverse Determination

Test measurement points were selected in accordance with USEPA Method 1, 40CFR60, Appendix A. The characteristics of the measurement location are summarized below.

TEST POINT INFORMATION							
Test Location	Stack Dimensions	No. of Ports	Port Length (Inches)	Upstream Diameters	Downstream Diameters	Test Parameter	Number of Sampling Points
Main Kiln	10.58'	2	6	7.86	15.72	D/F	12

Method 2 Volumetric Flow Rate Determination

Gas velocity was measured following USEPA Method 2, 40CFR60, Appendix A, for purposes of calculating stack gas volumetric flow rate and emission rates on a lb/hr basis. S-type pitot tubes, 0-10" differential pressure gauge, and K-type thermocouple and temperature readout were used to determine gas velocity at each sample point. All of the equipment used was calibrated in accordance with the specifications of the Method. Copies of field data sheets are included in Appendix G. Calibration data are presented in Appendix H. This testing met the performance specifications as outlined in the Method.

Method 3A Oxygen (O_2)/Carbon Dioxide (CO_2) Determination

Flue gas O_2 and CO_2 concentrations for the Main Kiln Stack were determined in accordance with USEPA Method 3A. An Ecom analyzer was used to determine the O_2 and CO_2 concentrations by connecting the analyzer to the exit of the dry gas meter. The O_2 instrument operates in the nominal range of 0% to 25% with the specific range determined by the high-level calibration gas. The CO_2 instrument operates in the nominal range of 0% to 20% with the specific range determined by the high-level calibration gas. High and mid-range calibrations were performed using USEPA Protocol gas. Zero nitrogen (a low ppm pollutant in balance nitrogen calibration gases) was introduced during other instrument calibrations to check instrument zero. Zero and mid-range calibrations were performed using USEPA Protocol gas after each test run. Calibration data are presented in Appendix H. Copies of the gas cylinder certifications are found in Appendix I.

Method 4 Moisture (H_2O) Determination

Stack gas moisture content was determined using a Method 4 sampling train as a component of the Method 23 sampling system. In this technique, stack gas was drawn through a series of impingers as detailed in EPA Method 23. The entire impinger train was measured or weighed before and after each test run to determine the mass of moisture condensed.

During testing, the sample train was operated in the manner specified in USEPA Method 4. All of the data specified in Method 4 (gas volume, delta H, impinger outlet well temperature, etc.) was recorded on field data sheets.

All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data is included in Appendix H.

Method 23 Dioxin and Furan Determination

Stack gas dioxin and furan concentrations and emission rates were determined in accordance with Method 23, 4CFR60, Appendix A. An Environmental Supply Company sampling train was used to sample for concentrations of dioxins and furans, in the manner specified in the Method.

A total of twelve (12) test points will be sampled per run. Six (6) test points were sampled using the two (2) ports that are 90 degrees apart at the stack test location.

The alternative recovery procedure was used that removes the methylene chloride recovery solvent rinse for toluene, as specified in ALT-036 - Approval Method 23 Modification for Cement Kilns.

After recovery, samples were analyzed by an accredited laboratory following the procedures specified in the Method. Laboratory analysis data are found in Appendix D. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data is presented in the Appendix H.

3.0 TEST RESULT SUMMARIES

Client: St. Marys Cement
Facility: Charlevoix, Michigan
Test Location: Main Kiln Stack
Test Method: 23

Source Condition	Mill On	Mill On	Mill On	
Date	4/22/21	4/22/21	4/22/21	
Start Time	9:06	13:10	16:56	
End Time	12:12	16:18	20:04	
	Run 1	Run 2	Run 3	Average
Stack Conditions				
Average Gas Temperature, °F	241.0	255.4	257.0	251.1
Flue Gas Moisture, percent by volume	8.0%	7.7%	7.5%	7.7%
Average Flue Pressure, in. Hg	30.18	29.98	29.98	30.05
Gas Sample Volume, dscf	147.261	151.809	152.064	150.378
Average Gas Velocity, ft/sec	77.825	82.287	82.551	80.888
Gas Volumetric Flow Rate, acfm	431,740	456,490	457,956	448,729
Gas Volumetric Flow Rate, dscfm	301,970	311,716	312,623	308,770
Gas Volumetric Flow Rate, scfm	328,057	337,635	337,945	334,546
Average $\%CO_2$ by volume, dry basis	20.3	20.6	20.8	20.6
Average $\%O_2$ by volume, dry basis	9.0	8.7	8.9	8.9
Isokinetic Variance	97.6	97.5	97.3	97.5
Baghouse Inlet Temperature, °F	236.3	249.4	251.3	245.7
PCDD/PCDF Emissions				
ng/dscm	≤ 0.05	≤ 0.13	≤ 0.03	≤ 0.07
ng/dscm TEQ	≤ 0.0024	≤ 0.0027	≤ 0.0023	≤ 0.0025
ng/dscm @ 7% O_2 Dry (TEQ)	≤ 0.0028	≤ 0.0031	≤ 0.0027	≤ 0.0029

Client: St. Marys Cement
Facility: Charlevoix, Michigan
Test Location: Main Kiln Stack
Test Method: 23

Source Condition	Mill Off		Mill Off		Mill Off		
Date	4/20/21		4/20/21		4/23/21		
Start Time	9:21		14:02		7:00		
End Time	13:05		17:29		10:05		
	Run 1		Run 2		Run 3		Average
Stack Conditions							
Average Gas Temperature, °F	399.0		397.7		399.1		398.6
Flue Gas Moisture, percent by volume	8.9%		8.8%		8.9%		8.9%
Average Flue Pressure, in. Hg	29.98		29.98		29.87		29.94
Gas Sample Volume, dscf	127.405		122.402		109.746		119.851
Average Gas Velocity, ft/sec	79.519		78.726		70.522		76.256
Gas Volumetric Flow Rate, acfm	441,135		436,735		391,222		423,031
Gas Volumetric Flow Rate, dscfm	247,492		245,654		218,720		237,289
Gas Volumetric Flow Rate, scfm	271,729		269,437		240,084		260,417
Average %CO_2 by volume, dry basis	21.8		22.5		23.1		22.5
Average %O_2 by volume, dry basis	6.6		5.9		6.0		6.2
Isokinetic Variance	103.0		99.7		100.4		101.0
Baghouse Inlet Temperature, °F	399.0		398.4		399.1		398.8
PCDD/PCDF Emissions							
ng/dscm	≤ 10.02		≤ 11.46		14.88	≤	12.12
ng/dscm TEQ	≤ 0.07		≤ 0.09		0.13	≤	0.10
ng/dscm @ 7% O_2 Dry (TEQ)	≤ 0.07		≤ 0.08		0.12	≤	0.09