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Compliance Emissions Test Report

Keebler Company
Grand Rapids Baking Facility
EUOVEN2
Preheat and Zones 1 through 6 Stacks
Grand Rapids, MI
Project No. M203412
September 22, 2020

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Report Submittal Date
November 19, 2020

Project No. M203412

Corporate Headquarters
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Elmhurst, Illinois 60126
630-993-2100

Chicago, IL | Crown Point, IN | Mendota Heights, MN | Denver, CO

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1.0 EXECUTIVE SUMMARY

MOSTARDI PLATT conducted a propylene glycol compliance emissions test program on seven (7) stacks venting emissions from the 9.6 mmBTU/hr natural gas fired oven (EUOVEN2) used in baking process producing Pop Tarts at the Keebler Company, Grand Rapids Baking Facility on September 22, 2020.

Keebler Company operates an oven used in the "Pop-Tart®" baking process. This process involves baking dough "pockets" with flavored fillings in "tunnel" ovens which have several exhaust stacks. EUOVEN2 has 6 stacks and 1 preheat stack to control the temperature in each zone as the Pop-Tarts® are passed on a conveyor through the oven for baking. Some of the flavorings used are dissolved in propylene glycol. The flavor of Pop-Tarts® that were baked during testing represent the highest propylene glycol content products (by volume) made at this facility. Pop-Tarts® contain filling in the dough pocket. The baking oven is designed to heat the filling in the pocket to approximately 180°F. Higher temperatures may cause the filling to bubble and break through the dough pocket. The purpose of this testing program was to determine what percentage of the propylene glycol (boiling point 370°F) is emitted from the product when passing through the oven.

This report summarizes the results of the test program and test methods used.

TEST INFORMATION		
Test Location	**Test Date**	**Test Parameter**
EUOVEN2 Preheat and Zones 1 through 6 Stacks	September 22, 2020	Propylene Glycol

Selected results of the test program are summarized below. A complete summary of emission test results follows the narrative portion of this report.

Test Location	Test Date	Operating Condition	Test Parameter	Emission Rate	Propylene Glycol Emission Rate %(lb/lb)
Preheat Stack	9/22/2020	Normal	Propylene Glycol	≤ 0.0031 lbs/hr	N/A
Zone 1Stack				≤ 0.0088 lbs/hr	N/A
Zone 2 Stack				≤ 0.0105 lbs/hr	N/A
Zone 3 Stack				0.3227 lbs/hr	N/A
Zone 4 Stack				0.6808 lbs/hr	N/A
Zone 5 Stack				0.3580 lbs/hr	N/A
Zone 6 Stack				0.3773 lbs/hr	N/A
Total				≤ 1.7612 lbs/hr	7.0

*No Emission limits exist for propylene glycol.

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

TEST PERSONNEL INFORMATION		
Location	**Address**	**Contact**
Test Facility	Keebler Company 310 28th Street South East Grand Rapids, Michigan 49548	Ms. Danielle Poma Environmental Health and Safety Manager (616) 247-4458 (phone) Danielle.poma@kellogg.com
Testing Company Representative	Mostardi Platt 888 Industrial Road Elmhurst, Illinois 60126	Mr. Mark Peterson Project Manager (630) 993-2100 mpeterson@mp-mail.com

The test crew consisted of Messrs. D. Panek, K. Beckham, M. Platt, S. Dyra, S. McGough, T. Schmitt and M. Peterson of Mostardi Platt.

2.0 TEST METHODOLOGY

Emission testing was conducted following the methods specified in 40 CFR, Part 60, Appendix A. Schematics of the test section diagrams and sampling trains used are included in Appendix A and B, respectively. Calculation examples and nomenclature are included in Appendix C. Copies of analyzer print-outs and field data sheets for each test run are included in Appendix D and E, respectively.

The following methodologies were used during the test program:

Method 1 Traverse Point Determination

Test measurement points were selected in accordance with Method 1. The characteristics of the measurement location are summarized below.

TEST POINT INFORMATION						
Location	**Diameter (Feet)**	**Area (Square Feet)**	**Upstream Diameters**	**Downstream Diameters**	**Test Parameter**	**Number of Sampling Points**
Preheat Stack	0.4583	0.16	>0.5	>2	Propylene Glycol	1
					Volumetric Flow Rate	16
Zones 1 through 6 Stacks	1.146	1.03	>0.5	>2	Propylene Glycol	1
					Volumetric Flow Rate	16

The absence of cyclonic flow was verified with a null point pitot traverse at each location prior to testing. The null point pitot traverse data is in Appendix E.

Method 2 Volumetric Flowrate Determination

Gas velocity was measured at the start and end of each compliance test following Method 2, for purposes of calculating stack gas volumetric flow rate. The average of both flows was used for calculating emissions on a weight basis. S-type pitot tubes, differential pressure gauges, thermocouples and temperature readouts were used to determine gas velocity at each sample

point at each test location. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix G.

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

Stack gas molecular weight was determined in accordance with Method 3. A Fyrite analyzer was used to determine stack gas oxygen and carbon dioxide content and, by difference, nitrogen content. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data is presented in Appendix G.

Method 4 Moisture Determination

Stack gas moisture content was determined using a Method 4 sampling train. In this technique, flue gas is drawn through a probe after which moisture is condensed through a series of four impingers. The first two impingers were charged with approximately 100 mls of deionized, distilled water. Impinger three was left empty and impinger four was charged with clean, dried silica gel. The water volumes of the impinger train were measured and the silica gel was weighed before and after each test run to determine the mass of moisture condensed.

During testing, the sample train was operated in the manner generally 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 are presented in Appendix G.

Modified Method 308 Propylene Glycol Determination

Propylene glycol concentrations were determined utilizing a modified Method 308, 40 CFR, Part 63, Appendix A. Three (3), one (1)-hour propylene glycol test runs were performed on each stack in accordance with the method. A sample of source gas was drawn through a midget impinger train containing chilled reagent water to absorb propylene glycol. The silica gel listed described in Method 308 was substituted with an XAD-7 resin tube to capture any break through. XAD-7 is a more appropriate sorbent for the capture of propylene glycol. This resin conforms to the requirements of the National Institute of Health and Safety Method 5523 for the capture of glycols.

The sampling system was recovered with Reagent grade DI and analyzed by GC-FID. Sample analysis data are found in Appendix F. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix G.

3.0 TEST RESULT SUMMARIES

USEPA METHOD 308 RESULTS SUMMARY
Keebler Company

Pre-Heat						
Run No.	Date	Time	Propylene glycol detected, ug	Propylene glycol Concentration, ppmvd	Air Flow, dscfm	Propylene glycol, lb/hr
1	9/22/2020	10:45-11:45	≤ 215	≤ 1.16	226	≤ 0.0031
2	9/22/2020	12:45-13:45	≤ 215	≤ 1.16	220	≤ 0.0030
3	9/22/2020	15:10-16:10	≤ 215	≤ 1.16	224	≤ 0.0031
Average			**≤ 215**	**≤ 1.16**	**223**	**≤ 0.0031**
Zone 1						
Run No.	Date	Time	Propylene glycol detected, ug	Propylene glycol Concentration, ppmvd	Air Flow, dscfm	Propylene glycol Concentration, lb/hr
1	9/22/2020	10:45-11:45	≤ 215	≤ 1.17	627	≤ 0.0087
2	9/22/2020	12:45-13:45	≤ 215	≤ 1.17	631	≤ 0.0087
3	9/22/2020	15:10-16:10	≤ 215	≤ 1.17	640	≤ 0.0089
Average			**≤ 215**	**≤ 1.17**	**633**	**≤ 0.0088**
Zone 2						
Run No.	Date	Time	Propylene glycol detected, ug	Propylene glycol Concentration, ppmvd	Air Flow, dscfm	Propylene glycol Concentration, lb/hr
1	9/22/2020	10:45-11:46	≤ 215	≤ 1.17	557	≤ 0.0077
2	9/22/2020	12:45-13:45	344	1.88	562	0.0125
3	9/22/2020	15:10-16:10	301	1.64	587	0.0114
Average			**≤ 287**	**≤ 1.56**	**568**	**≤ 0.0105**
Zone 2-Run 1 had one minute feed line delay						
Zone 3						
Run No.	Date	Time	Propylene glycol detected, ug	Propylene glycol Concentration, ppmvd	Air Flow, dscfm	Propylene glycol Concentration, lb/hr
1	9/22/2020	10:45-11:45	7,052	37.99	745	0.3353
2	9/22/2020	12:45-13:45	6,837	36.83	684	0.2985
3	9/22/2020	15:10-16:10	8,276	44.58	633	0.3343
Average			**7,388**	**39.80**	**687**	**0.3227**
Zone 4						
Run No.	Date	Time	Propylene glycol detected, ug	Propylene glycol Concentration, ppmvd	Air Flow, dscfm	Propylene glycol Concentration, lb/hr
1	9/22/2020	10:45-11:40	14,018	81.63	735	0.7109
2	9/22/2020	12:45-13:45	13,803	80.38	655	0.6238
3	9/22/2020	15:10-16:10	16,598	96.66	618	0.7077
Average			**14,806**	**86.22**	**669**	**0.6808**
Zone 4- Run 1 trap collected moisture and the run was stopped at 55 minutes						
Zone 5						
Run No.	Date	Time	Propylene glycol detected, ug	Propylene glycol Concentration, ppmvd	Air Flow, dscfm	Propylene glycol Concentration, lb/hr
1	9/22/2020	10:45-11:45	2,322	12.52	686	0.1018
2	9/22/2020	12:45-13:45	14,663	79.07	560	0.5246
3	9/22/2020	15:10-16:10	13,502	72.80	519	0.4477
Average			**10,162**	**54.797**	**588**	**0.3580**
Zone 6						
Run No.	Date	Time	Propylene glycol detected, ug	Propylene glycol Concentration, ppmvd	Air Flow, dscfm	Propylene glycol Concentration, lb/hr
1	9/22/2020	10:45-11:45	7,654	41.45	818	0.4017
2	9/22/2020	12:45-13:45	8,041	43.54	671	0.3462
3	9/22/2020	15:10-16:10	9,656	52.29	620	0.3841
Average			**8,450**	**45.76**	**703**	**0.3773**
Total						
Run No.	Date	Time	Propylene Glycol Emission Rate (lb/hr)	Flavoring Usage Rate (lb/hr) CONFIDENTIAL	Propylene Glycol Content (lb PG/lb flavor)	Propylene Glycol Usage Rate (lb/hr) CONFIDENTIAL	Propylene Glycol Emission Rate % (lb/lb)
1	9/22/2020	10:45-11:45	≤ 1.5692	[redacted]	0.8	[redacted]	6.7
2	9/22/2020	12:45-13:45	≤ 1.8173	[redacted]	0.8	[redacted]	7.1
3	9/22/2020	15:10-16:10	≤ 1.8972	[redacted]	0.8	[redacted]	7.4
Average			**≤ 1.7612**	[redacted]	**0.8**	[redacted]	**7.0**

4.0 CERTIFICATION

MOSTARDI PLATT is pleased to have been of service to Keebler Company. If you have any questions regarding this test report, please do not hesitate to contact us at 630-993-2100.

CERTIFICATION

As project manager, I hereby certify that this test report represents a true and accurate summary of emissions test results and the methodologies employed to obtain those results, and the test program was performed in accordance with the methods specified in this test report.

MOSTARDI PLATT

Program Manager

Mark E. Peterson

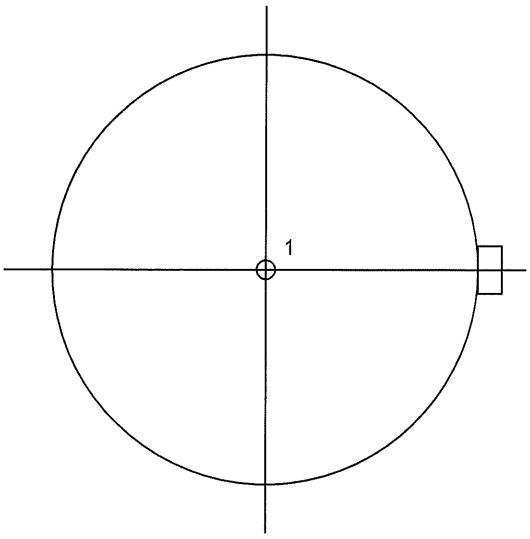
Quality Assurance

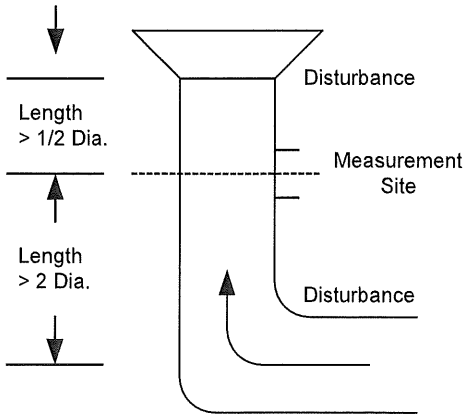
Jeffrey M. Crivlare

APPENDICES

Appendix A - Test Section Diagrams

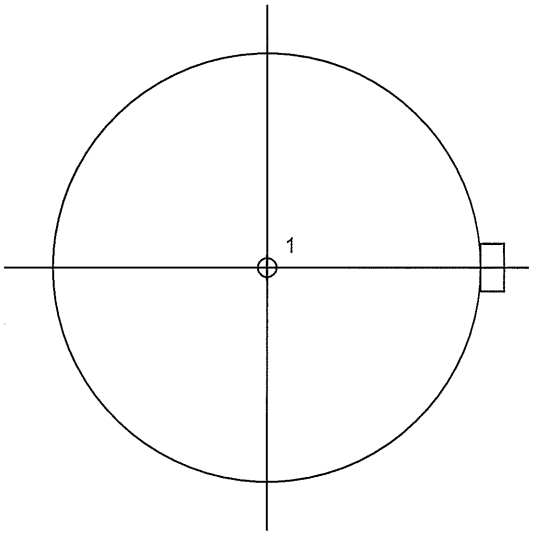
GASEOUS TRAVERSE FOR ROUND DUCTS

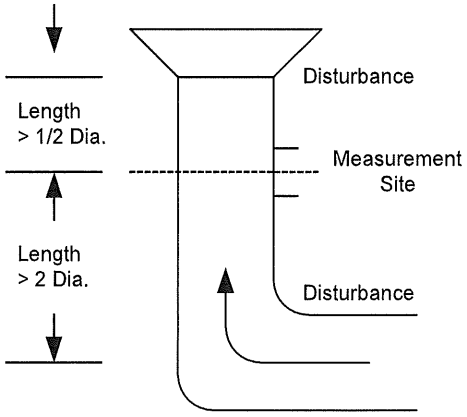




Job:	Keebler Company Grand Rapids Baking Facility
Date:	September 22, 2020
Unit:	Pop Tart Oven (EUOVEN2)
Test Location:	Preheat Stack
Duct Diameter:	0.4583 Feet
Duct Area:	0.16 Square Feet
No. of Points :	1
No. of Ports:	1

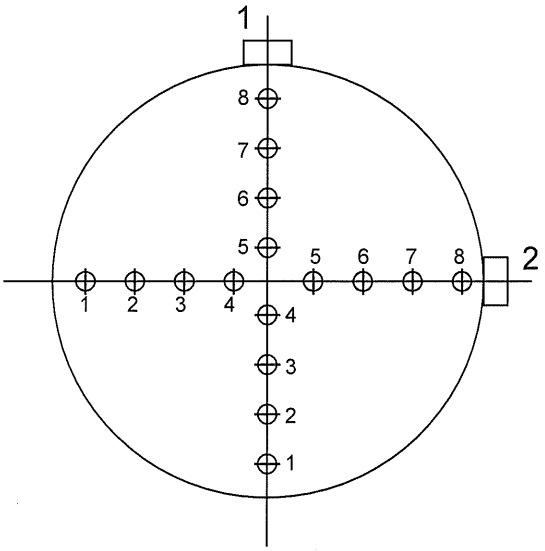
GASEOUS TRAVERSE FOR ROUND DUCTS

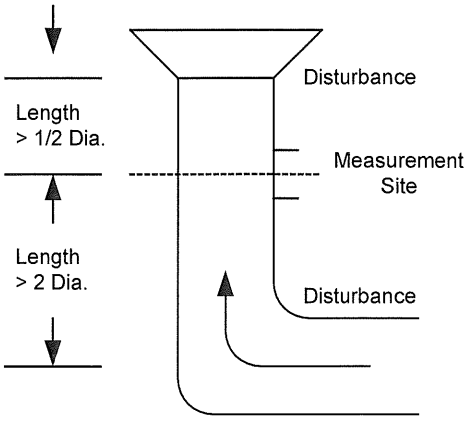




Job:	Keebler Company Grand Rapids Baking Facility
Date:	September 22, 2020
Unit:	Pop Tart Oven (EUOVEN2)
Test Location:	Zones 1 through 6 Stacks
Duct Diameter:	1.146 Feet
Duct Area:	1.03 Square Feet
No. of Points :	1
No. of Ports:	1

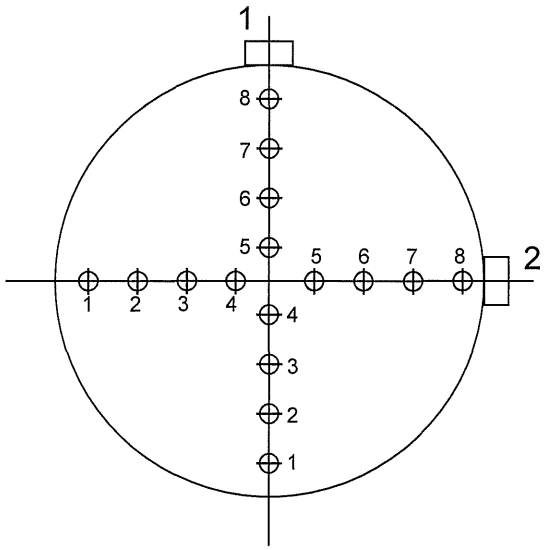
EQUAL AREA TRAVERSE FOR ROUND DUCTS

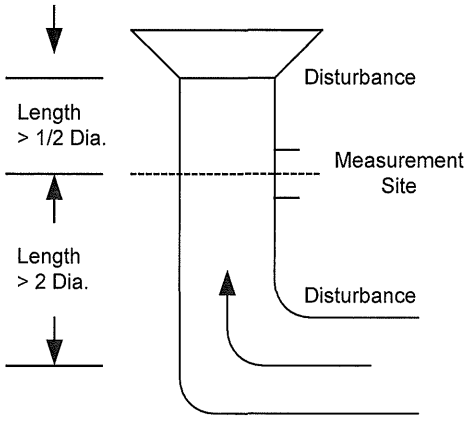




Job:	Keebler Company Grand Rapids, Michigan
Date:	September 22, 2020
Unit:	Pop Tart Oven (EUOVEN2)
Test Location:	Zones 1 - 6 Stacks
Stack Diameter (Feet):	1.146
Stack Area (Square Feet):	1.03
No. Sample Points Across Diameter:	16
No. of Ports:	2

EQUAL AREA TRAVERSE FOR ROUND DUCTS

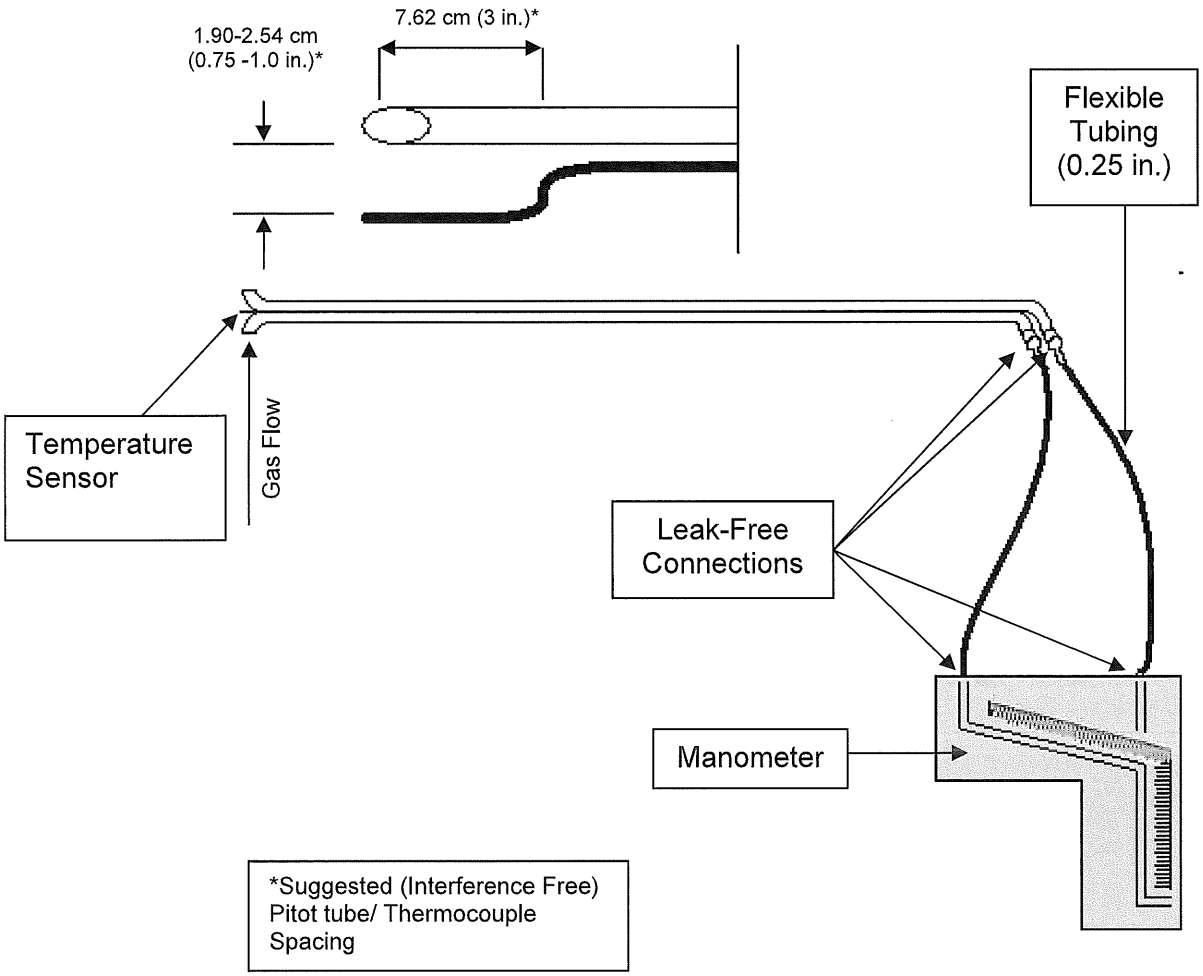




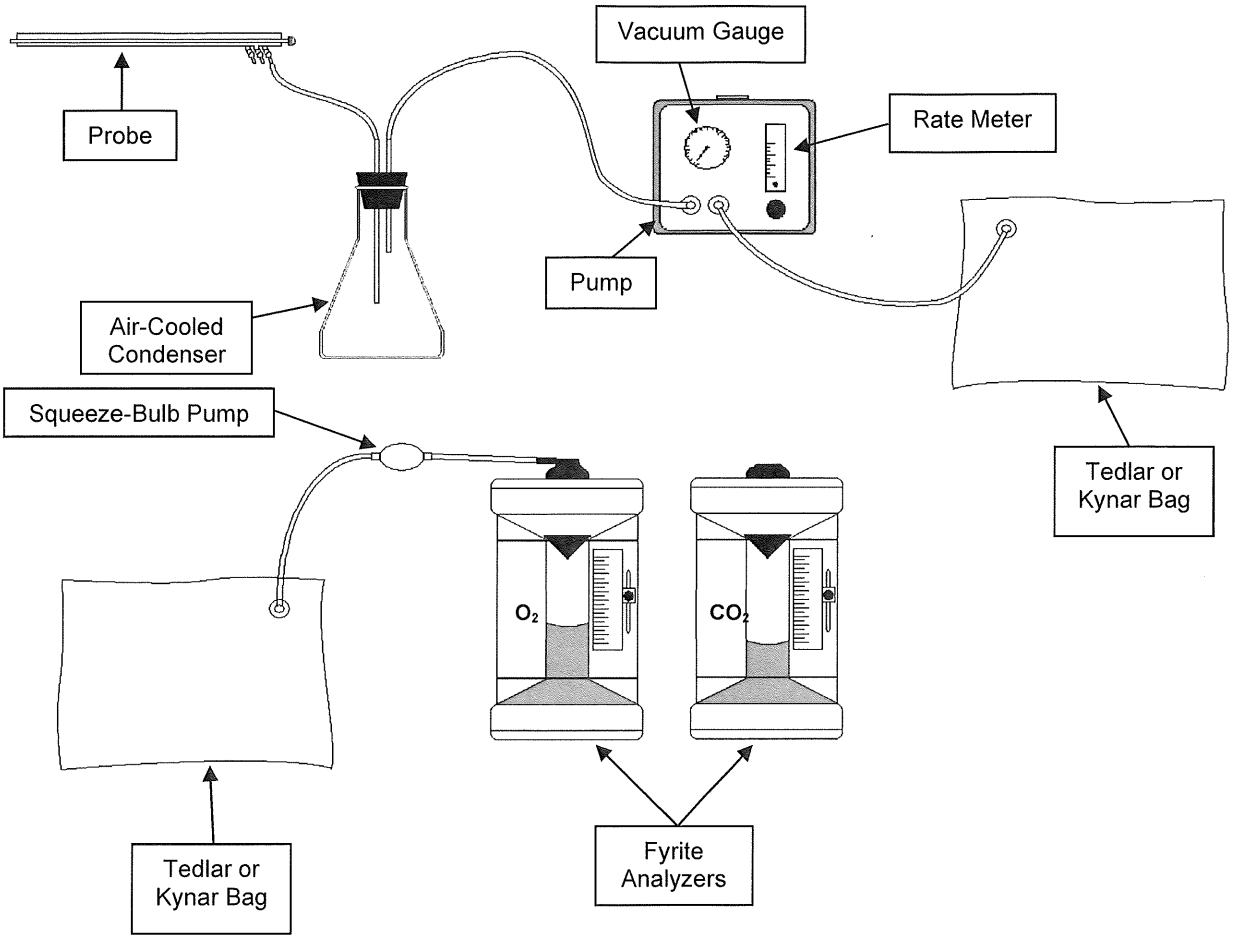
Job:	Keebler Company Grand Rapids, Michigan
Date:	September 22, 2020
Unit:	Pop Tart Oven (EUOVEN2)
Test Location:	Preheat Stack
Stack Diameter (Feet):	0.4583
Stack Area (Square Feet):	0.16
No. Sample Points Across Diameter:	16
No. of Ports:	2

Appendix B - Sample Train Diagrams

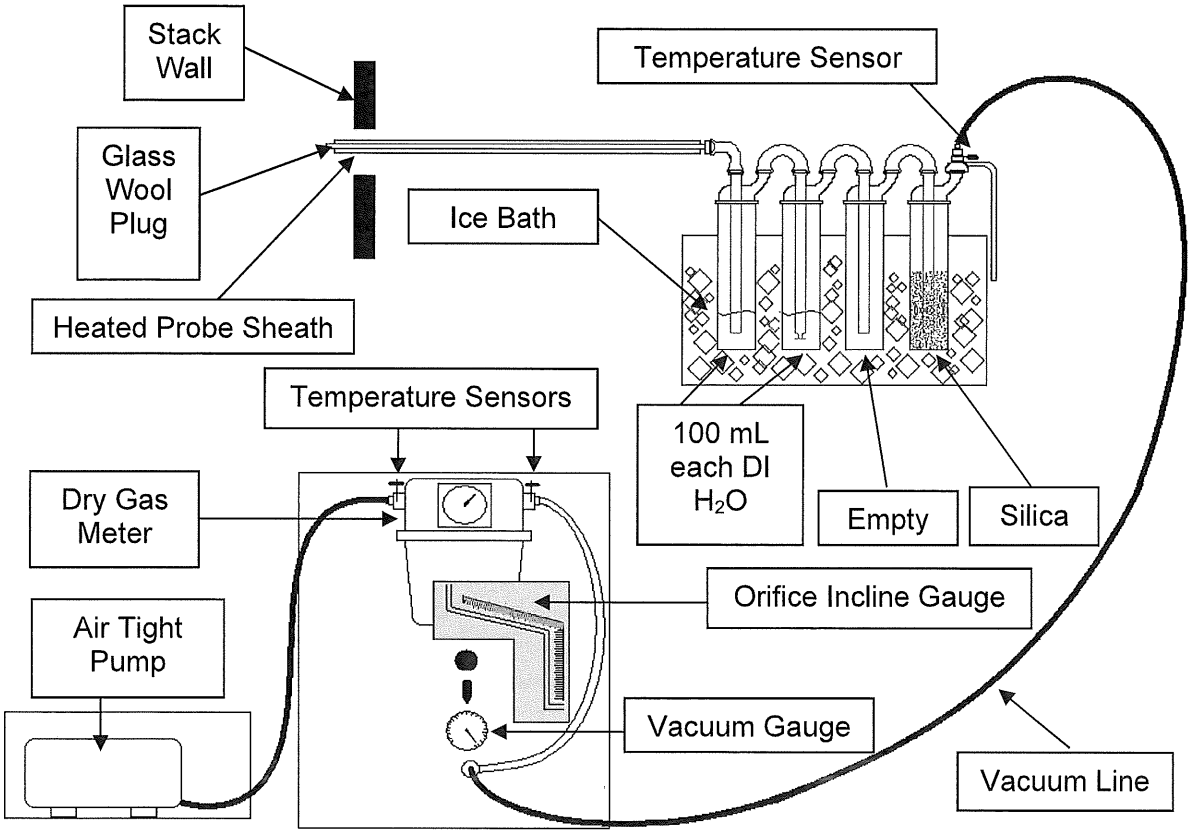
USEPA Method 2 – Type S Pitot Tube Manometer Assembly



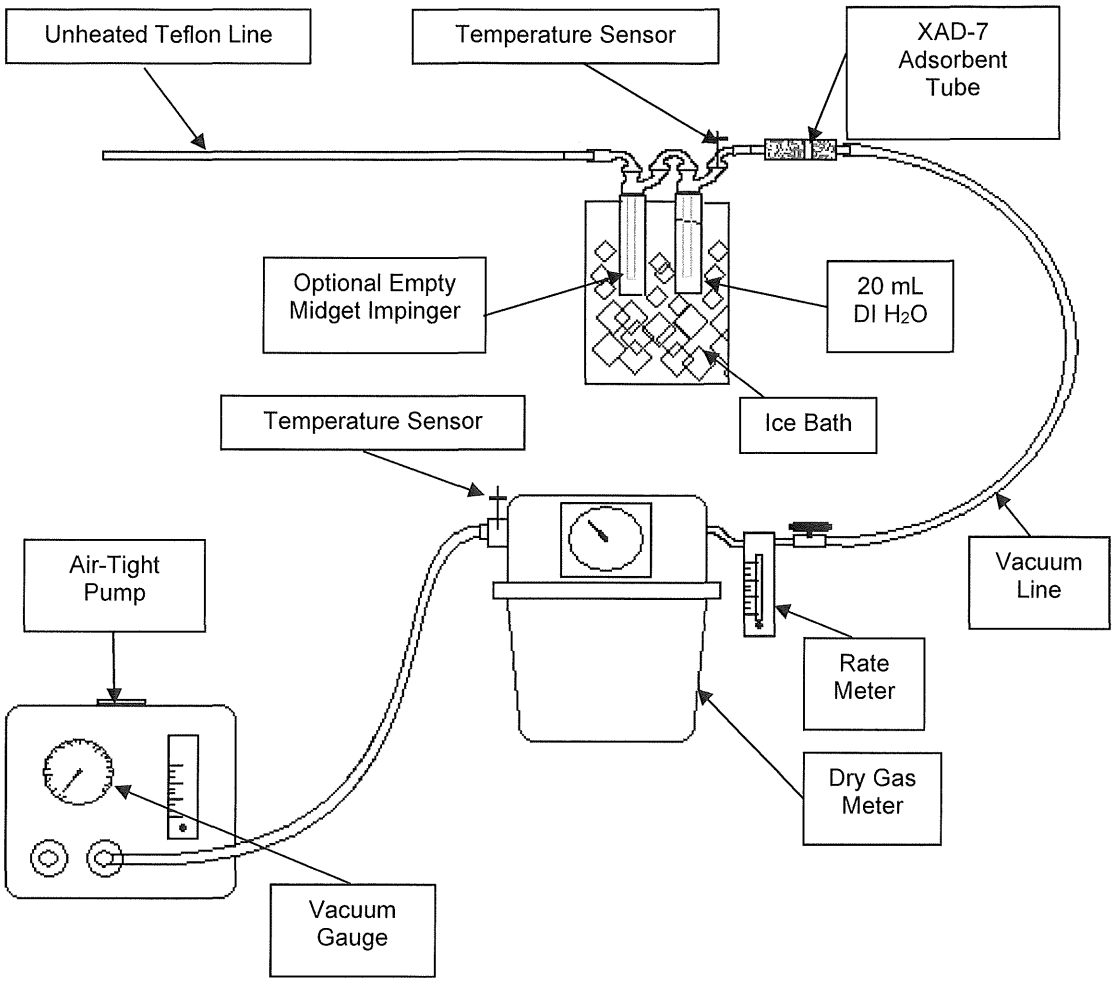
USEPA Method 3 - Integrated Oxygen/Carbon Dioxide Sample Train Diagram Utilizing Fyrite Gas Analyzer



USEPA Method 4- Moisture Content Sample Train Diagram



USEPA Modified Method 308- Propylene Glycol Sample Train Diagram



Appendix C - Calculation Nomenclature and Formulas