1.0 EXECUTIVE SUMMARY

MOSTARDI PLATT conducted a compliance emissions test program for Knauf Insulation on July 7 and 8, 2021 on the SV-Furnace 2 Stack, and SV-Furnace 1, 3 & 4 Stack in Albion, Michigan. This report summarizes the results of the test program and test methods used.

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

TEST INFORMATION		
Test Locations	**Test Dates**	**Test Parameters**
EU-Furnace 2 Stack	July 7 2021	Filterable Particulate Matter (FPM), Condensable Particulate Matter (CPM), Total Particulate Matter (TPM), and Visible Emissions (VE)
FG-Furnace 1, 3, & 4 Stack	July 8 2021	FPM, CPM, TPM and VE

The purpose of the test program was to demonstrate emissions with permitted limits. Selected results of the test program are summarized below. A complete summary of emission test results follows the narrative portion of this report.

TEST RESULTS				
Test Location	**Source Condition**	**Test Parameter**	**Emission Limit**	**Emission Rate**
SV-Furnace 2 Stack	Maximum	TPM	0.92 lb/hr	0.246 lb/hr
		VE	20%	0.0%
SV-Furnace 1, 3, & 4 Stack	Maximum	TPM	2.08 lb/hr	0.241 lb/hr
		VE	20%	0.0%

Run 3 on SV-Furnace 2 Stack encountered a testing issue and was stopped. A fourth run was conducted and all emissions are based on Runs 1, 2, and 4.

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

TEST PERSONNEL INFORMATION		
Location	**Address**	**Contact**
Test Coordinator	Knauf Insulation 1000 E. North Street Albion, Michigan 49224	Mr. Adam Estes (317) 421-4702 (phone) Adam.estes@knaufinsulation.com
Test Facility		
Testing Company Representative	Mostardi Platt 888 Industrial Drive Elmhurst, Illinois 60126	Mr. Christopher S. Trezak Senior Project Manager (630) 993-2100 (phone) ctrezak@mp-mail.com

The test crew consisted of Messrs. D. Panek, J. Gross, T. Long and C. Trezak of Mostardi Platt.

2.0 TEST METHODOLOGY

Emission testing was conducted following the methods specified in 40 CFR, Part 60, Appendix A, and 40 CFR, Part 51, Appendix M. 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 and laboratory analysis data are found in Appendix D. Copies of analyzer print-outs and field data sheets for each test run are included in Appendix E and F, 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	Duct Diameter (Feet)	Area (Square Feet)	Upstream Diameters	Downstream Diameters	Test Parameter	Number of Sampling Points
SV-Furnace 2 Stack	3.42	9.168	>0.5	>2.0	FPM, CPM, TPM	24
SV-Furnace 1, 3, & 4 Stack	3.95	12.254	>0.5	>2.0	FPM, CPM, TPM	24

Method 2 Volumetric Flowrate Determination

Gas velocity was measured following Method 2, for purposes of calculating stack gas volumetric flow rate at all test locations. 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 3A Oxygen (O_2)/Carbon Dioxide (CO_2) Determination

Stack gas molecular weight was determined in accordance with Method 3A at the test locations. ECOM analyzers were 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 and calibration data are included in Appendix G. Copies of the gas cylinder certifications are included in Appendix H.

Method 5 Filterable Particulate Matter Determination

Stack gas particulate concentrations and emission rates were determined in accordance with Method 5 at all test locations. An Environmental Supply Company, Inc. sampling train was used to sample stack gas at an isokinetic rate, as specified in the Method. Particulate matter in the sample probe was recovered using an acetone rinse. The probe wash and filter catch were analyzed by Mostardi Platt in accordance with the Method in the Elmhurst, Illinois laboratory. Laboratory data are found in Appendix D. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix G.

Method 202 Condensable Particulate Matter Determination

Stack gas condensable particulate matter concentrations and emission rates were determined in accordance with USEPA Method 202, in conjunction with Method 5 filterable particulate sampling at all test locations. This method applies to the determination of condensable particulate matter (CPM) emissions from stationary sources. It is intended to represent condensable matter as material that condenses after passing through a filter and as measured by this method.

The CPM was collected in the impinger portion of the Method 5 (Appendix A, 40CFR60) type sampling trains. The impinger contents were immediately purged after each run with nitrogen (N_2) to remove dissolved sulfur dioxide (SO_2) gases from the impinger contents. The impinger solution was then extracted with hexane. The organic and aqueous fractions were then taken to dryness and the residues weighed. A correction was made for any ammonia present due to laboratory analysis procedures. The total of both fractions represents the CPM.

All sample recovery was performed at the test site by the test crew. Mostardi Platt personnel at the laboratory in Elmhurst, Illinois, performed all final particulate sample analyses. Laboratory data are found in Appendix D. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix G.

Method 9 Visible Emission Determination

Visible emissions were determined in accordance with Method 9. The observer stood at a distance providing a clear view of the emissions with the sun oriented in the 140° sector to his back. As much as possible, the line of vision was approximately perpendicular to the plume direction.

Opacity observations were made at the point of greatest opacity in the portion of the plume where condensed water vapor was not present. Observations were made at 15-second intervals for the duration of the test run. Tests were a minimum of 60 minutes and conducted simultaneously with the TPM particulate matter testing.

Visible emissions observations were conducted and recorded by Mr. C. Trezak, who is a certified visual emissions observer. A copy of Mr. Trezak's certification is presented in Appendix I.

3.0 TEST RESULT SUMMARIES

Client: Knauf Insulation
Facility: Albion, Michigan
Test Location: SV-Furnace 2 Stack
Test Method: 5/202

Source Condition	Normal	Normal	Normal	
Date	7/7/21	7/7/21	7/7/21	
Start Time	7:45	9:33	13:45	
End Time	8:50	10:35	14:48	
	Run 1	Run 2	Run 4	Average
Stack Conditions				
Average Gas Temperature, °F	128.8	131.3	136.8	132.3
Flue Gas Moisture, percent by volume	3.8%	3.4%	3.0%	3.4%
Average Flue Pressure, in. Hg	29.00	29.00	29.00	29.00
Gas Sample Volume, dscf	57.615	56.938	61.047	58.533
Average Gas Velocity, ft/sec	34.048	33.767	36.457	34.757
Gas Volumetric Flow Rate, acfm	18,730	18,575	20,055	19,120
Gas Volumetric Flow Rate, dscfm	15,655	15,533	16,680	15,956
Gas Volumetric Flow Rate, scfm	16,278	16,076	17,197	16,517
Average $\%CO_2$ by volume, dry basis	0.2	0.2	0.2	0.2
Average $\%O_2$ by volume, dry basis	20.4	20.6	20.6	20.5
Isokinetic Variance	102.7	102.3	102.1	102.4
Filterable Particulate Matter (Method 5)				
grams collected	0.00040	0.00086	0.00333	0.00153
grains/acf	0.0001	0.0002	0.0007	0.0003
grains/dscf	0.0001	0.0002	0.0008	0.0004
lb/hr	0.014	0.031	0.120	0.055
Condensable Particulate Matter (Method 202)				
grams collected	0.00400	0.00354	0.00830	0.00528
grains/acf	0.0009	0.0008	0.0017	0.0011
grains/dscf	0.0011	0.0010	0.0021	0.0014
lb/hr	0.144	0.128	0.300	0.191
Total Particulate Matter (5/202)				
grams collected	0.00440	0.00440	0.01163	0.00681
grains/acf	0.0010	0.0010	0.0024	0.0015
grains/dscf	0.0012	0.0012	0.0029	0.0018
lb/hr	0.158	0.159	0.420	0.246

Client:	**Knauf Insulation**
Facility:	**Albion, Michigan**
Test Location:	**SV-Furnace 1, 3 and 4 Stack**
Test Method:	**5/202**

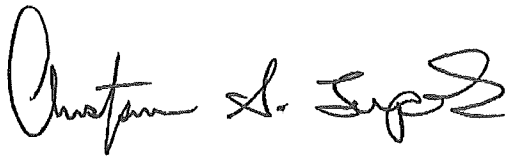
Source Condition	**Normal**	**Normal**	**Normal**	
Date	**7/8/21**	**7/8/21**	**7/8/21**	
Start Time	**10:10**	**11:50**	**13:23**	
End Time	**11:14**	**12:54**	**14:26**	
	Run 1	**Run 2**	**Run 3**	**Average**
Stack Conditions				
Average Gas Temperature, °F	121.8	122.9	123.4	122.7
Flue Gas Moisture, percent by volume	3.0%	2.2%	2.5%	2.6%
Average Flue Pressure, in. Hg	28.89	28.89	28.89	28.89
Gas Sample Volume, dscf	46.305	45.647	45.927	45.960
Average Gas Velocity, ft/sec	37.728	37.205	37.497	37.477
Gas Volumetric Flow Rate, acfm	27,740	27,355	27,570	27,555
Gas Volumetric Flow Rate, dscfm	23,589	23,400	23,486	23,492
Gas Volumetric Flow Rate, scfm	24,312	23,926	24,096	24,111
Average %CO_2 by volume, dry basis	0.1	0.2	0.1	0.1
Average %O_2 by volume, dry basis	20.7	20.7	20.7	20.7
Isokinetic Variance	101.6	101.0	101.3	101.3
Filterable Particulate Matter (Method 5)				
grams collected	0.00133	0.00147	0.00164	0.00148
grains/acf	0.0004	0.0004	0.0005	0.0004
grains/dscf	0.0004	0.0005	0.0006	0.0005
lb/hr	0.090	0.100	0.111	0.100
Condensable Particulate Matter (Method 202)				
grams collected	0.00190	0.00182	0.00253	0.00208
grains/acf	0.0005	0.0005	0.0007	0.0006
grains/dscf	0.0006	0.0006	0.0009	0.0007
lb/hr	0.128	0.123	0.171	0.141
Total Particulate Matter (5/202)				
grams collected	0.00323	0.00329	0.00417	0.00356
grains/acf	0.0009	0.0009	0.0012	0.0010
grains/dscf	0.0010	0.0011	0.0015	0.0012
lb/hr	0.218	0.223	0.282	0.241

4.0 CERTIFICATION

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

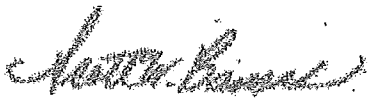
As project manager, I hereby certify that this test report represents a true and accurate summary of emissions test results and the methodologies employed to obtain those results, and the test program was performed in accordance with the methods specified in this test report.

MOSTARDI PLATT



Program Manager

Christopher S. Trezak



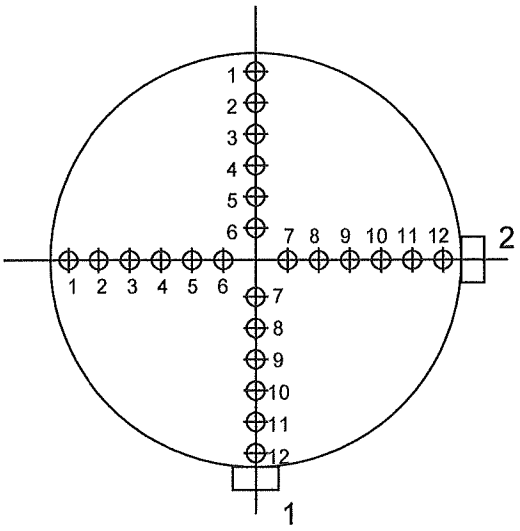
Quality Assurance

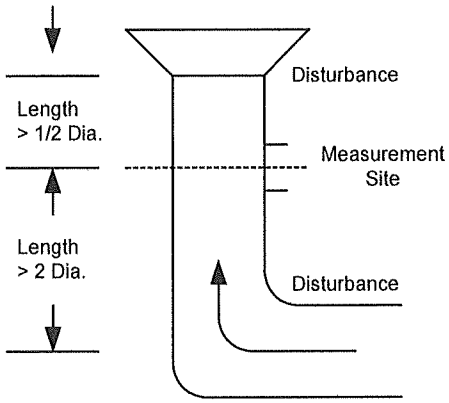
Scott W. Banach

APPENDICES

Appendix A - Test Section Diagrams

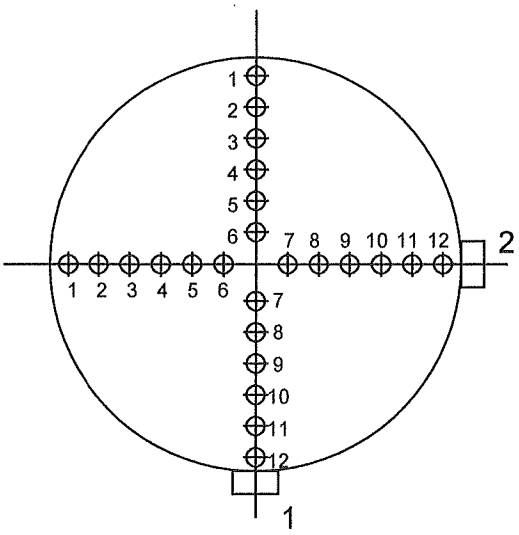
EQUAL AREA TRAVERSE FOR ROUND DUCTS

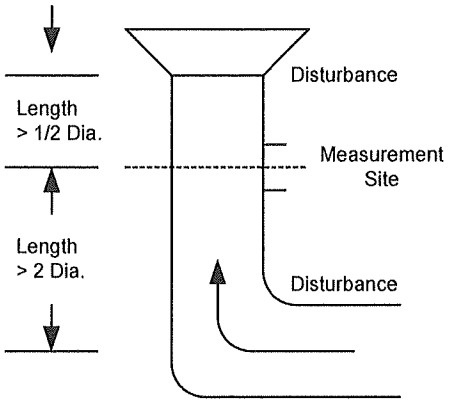




Job:	Knauf Insulation Albion Facility
Date:	July 7, 2021
Test Location:	SV-Furnace 2 Stack
Duct Diameter:	3.42 Feet
Duct Area:	9.168 Square Feet
No. Points Across Diameter:	12
No. of Ports:	2
Port Length:	6 inches

EQUAL AREA TRAVERSE FOR ROUND DUCTS

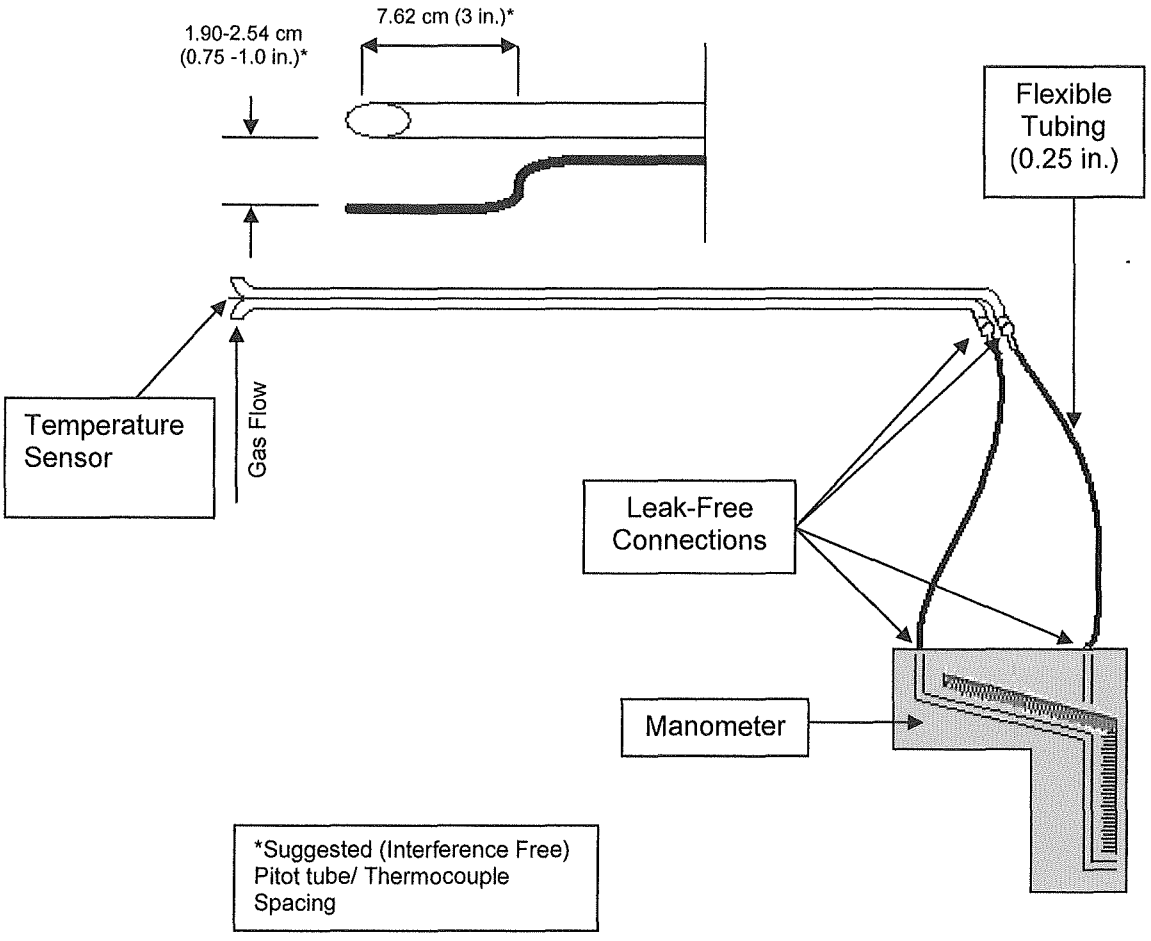




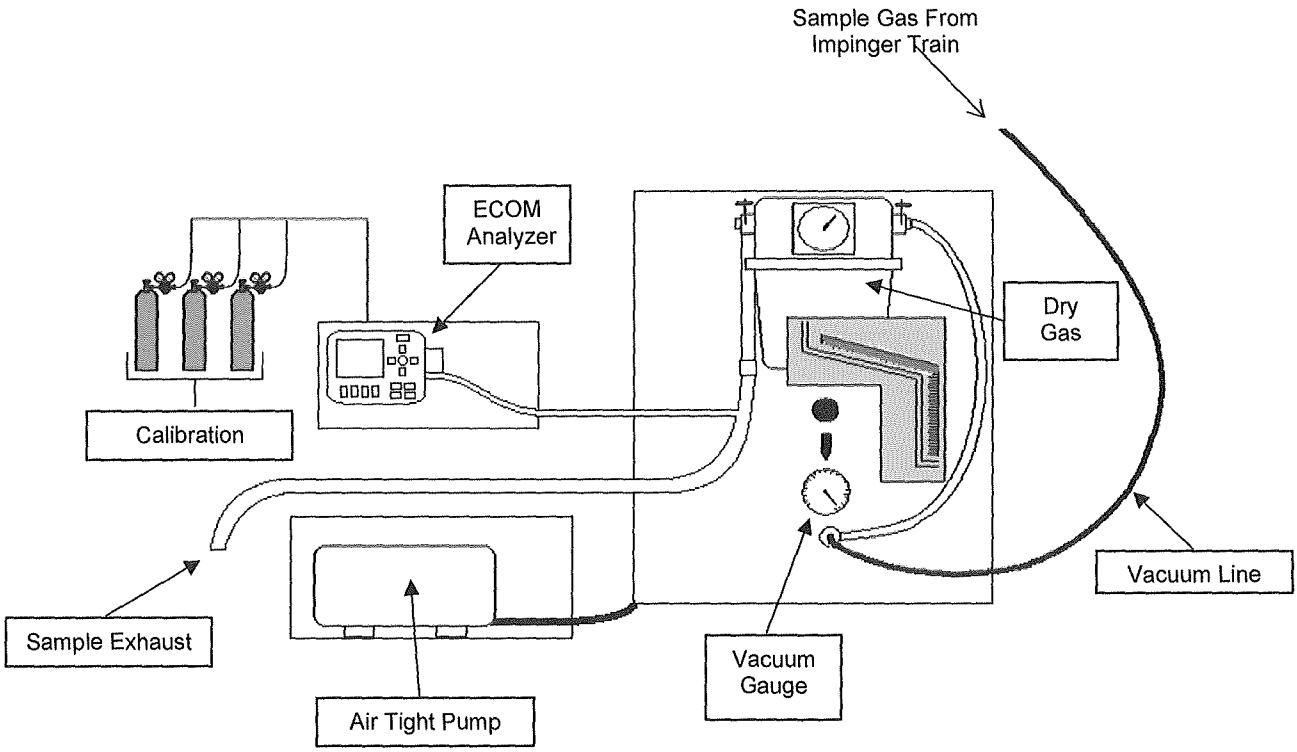
Job:	Knauf Insulation Albion Facility
Date:	July 8, 2021
Test Location:	SV-Furnace 1, 3 and 4 Stack
Duct Diameter:	3.95 Feet
Duct Area:	12.254 Square Feet
No. Points Across Diameter:	12
No. of Ports:	2
Port Length:	6 inches

Appendix B - Sample Train Diagrams

USEPA Method 2 – Type S Pitot Tube Manometer Assembly



USEPA Method 3A - Integrated Oxygen/Carbon Dioxide Sample Train Diagram Utilizing ECOM To Measure from Sample Exhaust



USEPA Method 5/202- Filterable/Condensable Particulate Matter