SHAMROCK
Particle Innovation • Surface Solutions

Shamrock Technologies, Inc.
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November 22, 2021

Melissa Duff, Director
Kentucky Division for Air Quality
300 Sower Boulevard, 2nd Floor
Frankfort, KY 40601

RE: Revised Application for Permit Renewal
Shamrock Technologies, Inc.
Community Drive, Henderson KY
Permit No. F-16-012 R1

Dear Ms. Duff,

Shamrock Technologies, Inc. (Shamrock) owns and operates a polytetrafluoroethylene (PTFE) recycling facility at 301 Community Drive in Henderson, Kentucky. Shamrock currently operates the facility in accordance with Permit No. F-16-012 R1, which was initially issued on July 8, 2016 and subsequently revised on May 3, 2018. Shamrock submitted a complete and timely renewal application on January 4, 2021. The renewal application included emission information for an increase in oven capacity for the facility tray ovens, for which Shamrock had submitted a minor permit revision in February, 2020. The Cabinet denied the minor permit revision on October 14, 2021 and requested Shamrock revise the renewal application to remove information regarding the tray oven capacity increase. Shamrock is submitting the enclosed revision to the renewal application as requested.

Enclosed please find Shamrock's revised application for renewal of Permit No. F-16-012 R1. If you have any questions regarding this submittal, please feel free to contact me.

Michael Jussila

Michael Jussila
Global Director of Manufacturing
Shamrock Technologies

CC: Robin. B. Thomerson
Susan Haynes

Application for Renewal of Conditional Major Air Permit F-16-012 R1

SHAMROCK TECHNOLOGIES, INC.
COMMUNITY DRIVE
HENDERSON, KENTUCKY

November 22, 2021

INTRODUCTION

Shamrock Technologies, Inc. (Shamrock) owns and operates a polytetrafluoroethylene (PTFE) recycling facility located on Community Drive in Henderson, Kentucky. PTFE is a material most well- known by the DuPont brand name Teflon. The PTFE is obtained from industrial, pre-consumer sources and includes PTFE scrap and off-spec products. Some of the PTFE contains pigments and some contains oil residue.

Shamrock currently operates the facility pursuant to Conditional Major Permit F-16-012 R1 which was issued on July 8, 2016 and revised on May 3, 2018. Permitted equipment at the facility includes (1) one ACM Mill, (2) three electron beams (E-Beams); (3) four Tray Ovens (4) seven mills; (5) two dispersion operations; and (6) a wax spray chill process. The current permit expires on July 8, 2021. Accordingly, Shamrock submitted an application for renewal of the permit on January 4, 2021 pursuant to 401 KAR 52:030 and Section G of the permit. Shamrock is now submitting this revision to the January 4, 2021 renewal application. The purpose of the revision is to remove emissions associated with the tray oven capacity increase which was requested by Shamrock in February 2020 but denied by the Cabinet on October 14, 2021.

Pursuant to 401 KAR 52:030 Section 4(2) (c), this renewal application provides "the information that is new or different from the most recent source-wide permit application."

DESCRIPTION OF NEW OR DIFFERENT INFORMATION SINCE LAST SOURCE-WIDE PERMIT APPLICATION

January 2016 was the last source-wide application for Permit No. F-16-012. The before mentioned was a renewal application. Then, on March 2, 2018 Shamrock submitted a Minor Permit Revision Request, and the Division granted those minor changes through issuance of Permit F-16-012 R1 on May 15, 2018.

Changes That Have Already Been Incorporated into the Permit

Emission Units 09 and 10 - Tray Oven 3 (D12) and Tray Oven 4 (D13)

On March 2, 2018 Shamrock submitted an application for a minor permit revision to authorize the construction and operation of two new Tray Ovens at the facility (Tray Ovens 3 and 4), to be used to bake PTFE that has been irradiated in one of the E-Beams in order to remove residual HF. Also included in this revision request was the addition of two new Product Collectors and Baghouses identical to the existing Tray Oven Product Collector (Insignificant Activity E4). These changes have already been incorporated into the permit by Revision 1 (F-16-012 R1) issued by DAQ on May 15, 2018.

Removal of Emission Unit E1 Blender Oven 1 and Thermal Oil Heater Insignificant Activity E6

On March 2, 2018 Shamrock also requested the removal of Emission Unit E1 Blender Oven 1 from the permit. This oven was taken out of operation on January 31, 2018 and physically disconnected from plant systems to preclude its operation. The Thermal Oil Heater (Insignificant Activity E6) was also removed as part of this project. These changes have already been incorporated into the permit by Revision 1 (F-16-012 R1) issued by DAQ on May 15, 2018.

Two corrections were requested related to E-Beam 3

On March 2, 2018 Shamrock requested Insignificant Activity 32 be deleted from the permit because the process heater is no longer in place and was never used. In addition to removing Insignificant Activity 32, the description for E-Beam 3 Emissions Unit B7 should list four baghouse product collectors instead of three. These changes have already been incorporated into the permit by Revision 1 (F-16-012 R1) issued by DAQ on May 15, 2018.

Changes That Have Not Been Incorporated into the Permit

Recent Testing, Removal from Service for Outdated Processing Equipment and Request Correction to a Typographical Error Within Current Permit

Shamrock has learned through recent testing that the ovens emit small amounts of particulate. Shamrock also learned during recent testing that the ICT E-Beam Vault Exhaust (currently permitted as Insignificant Emission Unit B1) and the E- Beam 3 Vault Exhaust (currently permitted as Insignificant Emission Unit B5) may potentially emit small amounts of HF and particulate. Shamrock is providing information on these emissions in this renewal application. Please refer to Appendix D for the explanation of the basis for the calculation of the newly identified PM and HF emissions.

Shamrock is also informing the Division that certain permitted emission units have been removed from service, and request that they be removed from the permit. These units are the ACM1 Mill (E2), Mill 7 (C5) and the two Heated Processing Units (C11).

Finally, there is a typographical error in the description of Insignificant Activities Mill 1 (D1 and D4) and Mill 2 (D5 and D8). Mill 1 is described in the permit as the White Mill and Mill 2 is described as the Gray Mill. These descriptions are reversed.

Conclusion

Shamrock is submitting this revision to the January 4, 2021 application for renewal of its existing conditional major permit the Community Drive facility in accordance with 401 KAR 52:030 Section 12(2). The existing conditional major permit expires on July 8, 2021. Accordingly, Shamrock applied for renewal of the permit on January 4, 2021 and therefore the renewal application was submitted at least six months prior to expiration of the current permit. Pursuant to 401 KAR 52:030 Section 4(2)(c), this renewal permit application "provides only information that is new or different from the most recent source-wide permit application." Therefore, this submittal is timely and complete such that the terms and conditions of the previous permit shall remain in effect until the renewal permit has been issued should the renewal permit not be issued before the expiration of the current permit as specified in 401 KAR 52:030 Section 12(4).

APPENDIX A

DEP 7007AI FORM

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007AI

Administrative Information

___ Section AI.1: Source Information
___ Section AI.2: Applicant Information
___ Section AI.3: Owner Information
___ Section AI.4: Type of Application
___ Section AI.5: Other Required Information
___ Section AI.6: Signature Block
___ Section AI.7: Notes, Comments, and Explanations

Additional Documentation

__ Additional Documentation attached

Source Name: Shamrock Technologies, Inc.
KY EIS (AFS) #: 21-101-00136
Permit #: F-16-012 R1
Agency Interest (AI) ID: 46709
Date:

Section AI.1: Source Information

Physical Location Address:	**Street:**	301 Community Drive				
	City:	Henderson	**County:**	Henderson	**Zip Code:**	42420
Mailing Address:	**Street or P.O. Box:**	Same as above				
	City:		**State:**		**Zip Code:**	

Standard Coordinates for Source Physical Location

Longitude: -87.641262 (decimal degrees) **Latitude:** 37.805884 (decimal degrees)

Primary (NAICS) Category: All other plastics products manufacturing **Primary NAICS #:** 326199

Classification (SIC) Category: Chemicals and Chemical Preparations NEC

Primary SIC #: 2899

Briefly discuss the type of business conducted at this site: Shamrock recycles polytetrafluoroethylene (PTFE) by irradiating the ground material and baking irradiated material to process into fresh micropowders for different applications within inks and coatings, etc.

Description of Area Surrounding Source: __ Rural Area _ Industrial Park __ Residential Area __ Urban Area X Industrial Area __ Commercial Area

Is any part of the source located on federal land? __ Yes X No

Number of Employees: 92 (approx)

Approximate distance to nearest residence or commercial property: 700 feet (approx)

Property Area: 11 acres (approx)

Is this source portable? __ Yes X No

What other environmental permits or registrations does this source currently hold or need to obtain in Kentucky?

NPDES/KPDES: X Currently Hold __ Need __ N/A

Solid Waste: __ Currently Hold __ Need X N/A

RCRA: X Currently Hold __ Need __ N/A

UST: __ Currently Hold __ Need X N/A

Type of Regulated Waste Activity: __ Mixed Waste Generator X Generator __ Recycler __ Other: ______________ __ U.S. Importer of Hazardous Waste __ Transporter __ Treatment/Storage/Disposal Facility __ N/A

Section AI.2: Applicant Information

Applicant Name: Shamrock Technologies, Inc.

Title: (if individual)

Mailing Address:
Street or P.O. Box: 301 Community Drive
City: Henderson **State:** KY **Zip Code:** 42420

Email: (if individual)

Phone: (270) 826-7006

Technical Contact

Name: Susan Haynes

Title: EHS Manager

Mailing Address:
Street or P.O. Box: 301 Community Drive
City: Henderson **State:** KY **Zip Code:** 42420

Email: shaynes@shamrocktechnologies.com

Phone: (270) 826-7006 EXT 2041

Air Permit Contact for Source

Name: Michael Jussila

Title: Global Director of Manufacturing

Mailing Address:
Street or P.O. Box: 301 Community Drive
City: Henderson **State:** KY **Zip Code:** 42420

Email: mjussila@shamrocktechnologies.com

Phone: (270) 826-7006 EXT 2044

Section AI.3: Owner Information

__ Owner same as applicant

Name: William Neuberg

Title: President

Mailing Address:
Street or P.O. Box: Foot of Pacific Street
City: Newark **State:** NJ **Zip Code:** 07114

Email: bneuberg@shamrocktechnologies.com

Phone: (973) 286-4889

List names of owners and officers of the company who have an interest in the company of 5% or more.

Name	Position
William Neuberg	Owner and President

Section AI.4: Type of Application

Current Status: __ Title V X Conditional Major __ State-Origin __ General Permit __ Registration __ None

Requested Action:
(check all that apply)

__ Name Change
X Renewal Permit
__ 502(b)(10) Change
__ Revision
__ Ownership Change
__ Initial Registration
__ Revised Registration
__ Extension Request
__ Off Permit Change
__ Closure
__ Significant Revision
__ Minor Revision
__ Addition of New Facility
__Landfill Alternate Compliance Submittal
__ Administrative Permit Amendment
__ Initial Source-wide OperatingPermit
__ Portable Plant Relocation Notice
__ Modification of Existing Facilities

Requested Status: __ Title V X Conditional Major __ State-Origin __ PSD __ NSR __ Other: ____________

Is the source requesting a limitation of potential emissions? __ Yes X No no change requested to existing HAP limititations

Pollutant:	**Requested Limit:**	**Pollutant:**	**Requested Limit:**
__ Particulate Matter		__ Single HAP	
__ Volatile Organic Compounds (VOC)		__ Combined HAPs	
__ Carbon Monoxide		__ Air Toxics (40 CFR 68, Subpart F)	
__ Nitrogen Oxides		__ Carbon Dioxide	
__ Sulfur Dioxide		__ Greenhouse Gases (GHG)	
__ Lead		__ Other	

For New Construction:

Proposed Start Date of Construction: *(MM/YYYY)* ____________

Proposed Operation Start-Up Date: *(MM/YYYY)* ____________

For Modifications:

Proposed Start Date of Modification: *(MM/YYYY)* ____________

Proposed Operation Start-Up Date: *(MM/YYYY)* ____________

Applicant is seeking coverage under a permit shield. **__ Yes** **__ No**

Identify any non-applicable requirements for which permit shield is sought on a separate attachment to the application.

Section AI.5 Other Required Information

Indicate the documents attached as part of this application:

__ DEP7007A Indirect Heat Exchangers and Turbines
__ DEP7007B Manufacturing or Processing Operations
__ DEP7007C Incinerators and Waste Burners
__ DEP7007F Episode Standby Plan
__ DEP7007J Volatile Liquid Storage
__ DEP7007K Surface Coating or Printing Operations
__ DEP7007L Mineral Processes
__ DEP7007M Metal Cleaning Degreasers
X DEP7007N Source Emissions Profile
__ DEP7007P Perchloroethylene Dry Cleaning Systems
__ DEP7007R Emission Offset Credit
__ DEP7007S Service Stations
__ DEP7007T Metal Plating and Surface Treatment Operations
__ DEP7007V Applicable Requirements and Compliance Activities
__ DEP7007Y Good Engineering Practice and Stack Height Determination
__ DEP7007AA Compliance Schedule for Non-complying Emission Units
__ DEP7007BB Certified Progress Report
__ DEP7007CC Compliance Certification
X DEP7007DD Insignificant Activities
__ DEP7007EE Internal Combustion Engines
__ DEP7007FF Secondary Aluminum Processing
__ DEP7007GG Control Equipment
__ DEP7007HH Haul Roads
__ Confidentiality Claim
__ Ownership Change Form
__ Secretary of State Certificate
__ Flowcharts or diagrams depicting process
__ Digital Line Graphs (DLG) files of buldings, roads, etc.
__ Site Map
__ Map or drawing depicting location of facility
__ Safety Data Sheet (SDS)
__ Emergency Response Plan
X Other: Emission calculations

Section AI.6: Signature Block

I, the undersigned, hereby certify under penalty of law, that I am a responsible official*, and that I have personally examined, and am familiar with, the information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the information is on knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false or incomplete information, including the possibility of fine or imprisonment.

Michael Jussila
Authorized Signature

11/19/2021
Date

Michael Jussila
Type or Printed Name of Signatory

Global Director of Manufacturing
Title of Signatory

*Responsible official as defined by 401 KAR 52:001.

APPENDIX B

DEP 7007DD FORM

Division for Air Quality
300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007DD

Insignificant Activities

___ Section DD.1: Table of Insignificant Activities
___ Section DD.2: Signature Block
___ Section DD.3: Notes, Comments, and Explanations

Source Name: Shamrock Technologies, Inc.
KY EIS (AFS) #: 21-101-00136
Permit #: F-16-012 R1
Agency Interest (AI) ID: 46709
Date:

Section DD.1: Table of Insignificant Activities

*Identify each activity with a unique Insignificant Activity number (IA #); for example: 1, 2, 3… etc.

Insignificant Activity #	Description of Activity including Rated Capacity	Serial Number or Other Unique Identifier	Applicable Regulation(s)	Calculated Emissions
1	B1 (ICT Vault Exhaust)	B1	401 KAR 59:010 401 KAR 53:010	PM / PM10 / PM2.5: 0.016 ton/yr HF: 0.0186 ton/yr
29	B5 (E-Beam 3 Vault Exhaust)	B5	401 KAR 59:010 401 KAR 53:010	PM / PM10 / PM2.5: 0.025 ton/yr HF: 0.0167 ton/yr

Adding estimates of previously unquantified particulate and HF emissions.

Section DD.2: Signature Block

I, THE UNDERSIGNED, HEREBY CERTIFY UNDER PENALTY OF LAW, THAT I AM A RESPONSIBLE OFFICIAL, AND THAT I HAVE PERSONALLY EXAMINED, AND AM FAMILIAR WITH, THE INFORMATION SUBMITTED IN THIS DOCUMENT AND ALL ITS ATTACHMENTS. BASED ON MY INQUIRY OF THOSE INDIVIDUALS WITH PRIMARY RESPONSIBILITY FOR OBTAINING THE INFORMATION, I CERTIFY THAT THE INFORMATION IS ON KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE OR INCOMPLETE INFORMATION, INCLUDING THE POSSIBILITY OF FINE OR IMPRISONMENT.

	Michael Jussila	11/19/2021
	Authorized Signature	**Date**
By:		
	Michael Jussila	Global Director of Manufacturing
	Type/Print Name of Signatory	**Title of Signatory**

APPENDIX C

DEP 7007N FORM

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007N

Source Emissions Profile

__ Section N.1: Emission Summary
__ Section N.2: Stack Information
__ Section N.3: Fugitive Information
__ Section N.4: Notes, Comments, and Explanations

Additional Documentation

__ Complete DEP7007AI

Source Name: Shamrock Technologies, Inc.
KY EIS (AFS) #: 21-101-00136
Permit #: F-16-012 R1
Agency Interest (AI) ID: 46709
Date:

N.1: Emission Summary

Emiss Unit #	Emission Unit Name	Process ID	Process Name	Control Device Name	Control Device ID	Stack ID	Maximum Design Capacity *(SCC Units/hour)*	SCC Units	Pollutant	Uncontrolled Emission Factor *(lb/SCC Units)*	Emission Factor Source (e.g. AP-42, Stack Test, Mass Balance)	Capture Efficiency *(%)*	Control Efficiency *(%)*	Hourly Emissions		Annual Emissions	
														Uncontrolled Potential *(lb/hr)*	Controlled Potential *(lb/hr)*	Uncontrolled Potential *(tons/yr)*	Controlled Potential *(tons/yr)*
D9	Tray Oven 1	D9	Tray Oven 1	Scrubber 1	S1	B-3	0.050	thousand lbs	PM/PM10/ PM2.5	1.56	Stack Test	100%	0.0%	0.078	0.078	0.34	0.34

Adding estimates of previously unquantified particulate emissions. No changes to other pollutants.

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007N

Source Emissions Profile

__ Section N.1: Emission Summary
__ Section N.2: Stack Information
__ Section N.3: Fugitive Information
__ Section N.4: Notes, Comments, and Explanations

Additional Documentation

__ Complete DEP7007AI

Source Name: Shamrock Technologies, Inc.
KY EIS (AFS) #: 21-101-00136
Permit #: F-16-012 R1
Agency Interest (AI) ID: 46709
Date:

N.1: Emission Summary

Emiss Unit #	Emission Unit Name	Process ID	Process Name	Control Device Name	Control Device ID	Stack ID	Maximum Design Capacity *(SCC Units/hour)*	SCC Units	Pollutant	Uncontrolled Emission Factor *(lb/SCC Units)*	Emission Factor Source (e.g. AP-42, Stack Test, Mass Balance)	Capture Efficiency *(%)*	Control Efficiency *(%)*	Hourly Emissions		Annual Emissions	
														Uncontrolled Potential *(lb/hr)*	Controlled Potential *(lb/hr)*	Uncontrolled Potential *(tons/yr)*	Controlled Potential *(tons/yr)*
D11	Tray Oven 2	D11	Tray Oven 2	Scrubber 1	S1	B-3	0.050	thousand lbs	PM/PM10/ PM2.5	1.56	Stack Test	100%	0.0%	0.078	0.078	0.34	0.34

Adding estimates of previously unquantified particulate emissions. No changes to other pollutants.

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007N

Source Emissions Profile

__ Section N.1: Emission Summary
__ Section N.2: Stack Information
__ Section N.3: Fugitive Information
__ Section N.4: Notes, Comments, and Explanations

Additional Documentation

__ Complete DEP7007AI

Source Name: Shamrock Technologies, Inc.
KY EIS (AFS) #: 21-101-00136
Permit #: F-16-012 R1
Agency Interest (AI) ID: 46709
Date:

N.1: Emission Summary

Emiss Unit #	Emission Unit Name	Process ID	Process Name	Control Device Name	Control Device ID	Stack ID	Maximum Design Capacity *(SCC Units/hour)*	SCC Units	Pollutant	Uncontrolled Emission Factor *(lb/SCC Units)*	Emission Factor Source (e.g. AP-42, Stack Test, Mass Balance)	Capture Efficiency *(%)*	Control Efficiency *(%)*	Hourly Emissions		Annual Emissions	
														Uncontrolled Potential *(lb/hr)*	Controlled Potential *(lb/hr)*	Uncontrolled Potential *(tons/yr)*	Controlled Potential *(tons/yr)*
D12	Tray Oven 3	D12	Tray Oven 3	Scrubber 1	S1	B-3	0.050	thousand lbs	PM/PM10/ PM2.5	1.56	Stack Test	100%	0.0%	0.08	0.08	0.34	0.34

Adding estimates of previously unquantified particulate emissions. No changes to other pollutants.

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007N

Source Emissions Profile

__ Section N.1: Emission Summary
__ Section N.2: Stack Information
__ Section N.3: Fugitive Information
__ Section N.4: Notes, Comments, and Explanations

Additional Documentation

__ Complete DEP7007AI

Source Name: Shamrock Technologies, Inc.
KY EIS (AFS) #: 21-101-00136
Permit #: F-16-012 R1
Agency Interest (AI) ID: 46709
Date:

N.1: Emission Summary

Emiss Unit #	Emission Unit Name	Process ID	Process Name	Control Device Name	Control Device ID	Stack ID	Maximum Design Capacity *(SCC Units/hour)*	SCC Units	Pollutant	Uncontrolled Emission Factor *(lb/SCC Units)*	Emission Factor Source (e.g. AP-42, Stack Test, Mass Balance)	Capture Efficiency *(%)*	Control Efficiency *(%)*	Hourly Emissions		Annual Emissions	
														Uncontrolled Potential *(lb/hr)*	Controlled Potential *(lb/hr)*	Uncontrolled Potential *(tons/yr)*	Controlled Potential *(tons/yr)*
D13	Tray Oven 4	D13	Tray Oven 4	Scrubber 1	S1	B-3	0.050	thousand lbs	PM/PM10/ PM2.5	1.56	Stack Test	100%	0.0%	0.08	0.08	0.34	0.34

Adding estimates of previously unquantified particulate emissions. No changes to other pollutants.

APPENDIX D

DETAILED EMISSION CALCULATIONS

Shamrock Technologies, Inc.
Community Drive

11/12/2021

Process	Em Unit ID	Emission Unit	Stack ID	Stack Flow Rate (acfm)^1	Air Pollution Control Device	Maximum Throughputs^2					Throughput Notes	Collector Type	PM / PM$_{10}$ Emissions				
						Operating Parameter	Max Hours (hrs/yr)	Hourly Rate (units/hr)	Annual Rate (units/yr)	Process Rate Units			Outlet PM (grains / ascf)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)
ICT E-Beam	B1	ICT vault exhaust	B-1		None	Irradiation rate	8,760	80.0	700,800	kW-hr		NA	NA	4.46E-05	0%	0.016	0.016
	B2	ICT window exhaust	B-2		None	NA - ambient air only											
	B3-1	ICT product collector baghouses (three) - **PM emissions due to solids handling**	B-8	8,000	Scrubber (S3)	Hours of operation	8,760	1	8,760	hours	PM emissions calculated based on outlet grain loading and operating hours		0.0025	0.171	0%	0.75	0.75
	B3-2	ICT product collector baghouses (three) - **VOC emissions due to cutting oils**	B-8		Scrubber (S3)	PTFE shavings with cutting oil	1,000	0.400	400	thousand lbs	400,000 lb/yr shavings received. Shavings cutting oil content is 0.7 wt%.						
	B3-3	ICT product collector baghouses (three) - **Emissions due to irradiation**	B-8		Scrubber (S3)	Irradiation rate	8,760	80.0	700,800	kW-hr	Emissions due to irradiation						
	B4	ICT process heater (1.2 MMBtu/hr natural gas)	B-4		None	Natural gas	8,760	0.00118	10.3	MMft3 natural gas	Products of natural gas combustion only. No process gases.	NA		7.6	0%	0.039	0.039
E-Beam 3	B5	Vault exhaust	B-5		None	Irradiation rate	8,760	128	1,121,280	Kw-hr		NA	NA	4.46E-05	0%	0.025	0.025
	B6	Window exhaust	B-6		None	NA - ambient air only											
	B7-1	Four material recovery devices (baghouses) - **PM emissions due to solids handling**	B-7	6,289	Scrubber (S2)	Hours of operation	8,760	1	8,760	hours	PM emissions calculated based on outlet grain loading and operating hours		0.0025	0.135	0%	0.59	0.59
	B7-2	Four material recovery devices (baghouses) - **VOC emissions due to cutting oils**	B-7		Scrubber (S2)	PTFE shavings with cutting oil	714	0.560	400	thousand lbs	400,000 lb/yr shavings received. Shavings cutting oil content is 0.7 wt%.						
	B7-3	Four material recovery devices (baghouses) - **Emissions due to irradiation**	B-7		Scrubber (S2)	Irradiation rate	8,760	128	1,121,280	Kw-hr	Emissions due to irradiation						

Process	Em Unit ID	Emission Unit	Stack ID	Stack Flow Rate (acfm)[1]	Air Pollution Control Device	Maximum Throughputs[2]					Throughput Notes	Collector Type	PM / PM$_{10}$ Emissions				
						Operating Parameter	Max Hours (hrs/yr)	Hourly Rate (units/hr)	Annual Rate (units/yr)	Process Rate Units			Outlet PM (grains / ascf)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)
Dynamitron E-Beam	D6-1	Dynamitron north vault exhaust (entrance side) - **VOC emissions due to cutting oils** - batch process - batch size is 968 lbs - cycle time is 114 minutes	D-6		None	PTFE heels and cones with isopar oil	589	0.509	300	thousand lbs	300,000 lb/yr heels/cones received, isopar oil content ranges from 5 to 11 wt%, typical is 5 wt%.	NA					
	D6-2	Dynamitron north vault exhaust (entrance side) - **Emissions due to irradiation**	D-6		None	Irradiation rate	8,760	120	1,051,200	kW-hr	Emissions due to irradiation						
	D7-1	Dynamitron south vault exhaust (exit side) - **VOC emissions due to cutting oils** -batch process - batch size is 968 lbs - cycle time is 114 minutes	D-7		None	PTFE heels and cones (with isopar oil)	589	0.509	300	thousand lbs	300,000 lb/yr heels/cones received, isopar oil content ranges from 5 to 11 wt%, typical is 5 wt%.	NA					
	D7-2	Dynamitron south vault exhaust (exit side) - **Emissions due to irradiation**	D-7		None	Irradiation rate	8,760	120	1,051,200	kW-hr	Emissions due to irradiation						
	D2-1 D10-1	Dynamitron product collector baghouses (two sets of three) - **PM emissions due to solids handling** - Collectors D2 and D10 do not operate simultaneously.	D-2 D-10	2,713	None	Hours of operation	1,440.8	1.00	1,440.8	hours	Dynamitron collectors are used to collect product from the Dynamitron e-Beam, and to collect product from Tray Ovens 1 through 4. When serving the Dynamitron, collectors operate 14 minutes during every 114 minute Dynamitron batch cycle, which equates to 14 / 114 x 8760 = 1,075.8 hours per year. When serving the Tray Ovens, the collectors operate 15 minutes for each tray oven 24 hour batch (worst-case). Annual operation = 4 ovens x 0.25 hr / 24 hours x 8760 = 365 hr/yr. Total collector operation is therefore 1075.8 +365 = 1440.8 hours per year.		0.0025	9.69E-04	0%	7.0E-04	7.0E-04
	D2-2 D10-2	Dynamitron product collector baghouses (two sets of three) - **Cobalt emissions due to pigments**	D-2 D-10		None	Pigmented PTFE (with carbon, cobalt, etc.)	589	0.509	300	thousand lbs	Up to 300,000 lb/yr pigmented PTFE processed. Carbon is main pigment, cobalt is approx 5% of total pigmented scrap, at 5 wt% cobalt content.						
	D2-3 D10-3	Dynamitron product collector baghouses (two sets of three) - **Emissions due to irradiation** - batch process - batch size is 968 lbs - cycle time is 114 minutes. Collectors D2 and D10 do not operate simultaneously.	D-2 D-10		None	Irradiation rate	1,076	120	129,095	kW-hr	Emissions due to irradiation. Maximum Dynamitron operating rate is 14 minutes during every 114 minute batch.						
~~ACM 1~~	~~E2~~	~~ACM 1 grinder product collector baghouse -~~ Moved to another facility															
ACM 2	E3	ACM 2 grinder product collector baghouse	E-3	2,500	None	Irradiated PTFE	8,760	0.300	2,628	thousand lbs	No pigmented material processed	Filtech / Southern Felt	0.0000055	3.93E-04	0%	5.2E-04	5.2E-04
Tray Oven 1 (Blue Oven)	D9	Tray oven 1 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3		Scrubber (S1)	Irradiated PTFE (no oils)	8,760	0.0500	438	thousand lbs		NA	NA	1.56	0%	0.341	0.341
Tray Oven 2	D11	Tray oven 2 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3		Scrubber (S1)	Irradiated PTFE (no oils)	8,760	0.0500	438	thousand lbs		NA	NA	1.56	0%	0.341	0.341

Process	Em Unit ID	Emission Unit	Stack ID	Stack Flow Rate (acfm)^1	Air Pollution Control Device	Maximum Throughputs^2					Throughput Notes	Collector Type	PM / PM$_{10}$ Emissions				
						Operating Parameter	Max Hours (hrs/yr)	Hourly Rate (units/hr)	Annual Rate (units/yr)	Process Rate Units			Outlet PM (grains / ascf)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)
Tray Oven 3	D12	Tray oven 3 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3		Scrubber (S1)	Irradiated PTFE (no oils)	8,760	0.0500	438	thousand lbs		NA	NA	1.56	0%	0.341	0.341
Tray Oven 4	D13	Tray oven 4 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3		Scrubber (S1)	Irradiated PTFE (no oils)	8,760	0.0500	438	thousand lbs		NA	NA	1.56	0%	0.341	0.341
Tray Ovens Vacuum Product Collectors (Three)	E4	Tray oven vacuum product collector baghouses - batch process - batch collected during one 30-minute period during each 24-hour batch for each oven. Each collector can only serve one oven at a time. Annual operation = 4 ovens x 0.5 hr / 24 hours x 8760 = 730 hr/yr	E-4	350	None	Irradiated baked PTFE (no oils)	730	1	730	hours of operation	Assume all HF baked off in oven.		0.0025	7.50E-03	0%	2.7E-03	2.7E-03
Mill 1 (Gray ~~White~~ Mill)	D1	Mill 1 (Gray ~~White~~ Mill) and product collector	D-1	3,900	None	Irradiated PTFE	8,760	0.500	4,380	thousand lbs		Filtech / Southern Felt	0.0000055	3.68E-04	0%	8.1E-04	8.1E-04
	D4	Mill 1 product collector baghouse	D-4	1,000	None	Irradiated PTFE	8,760	0.500	4,380	thousand lbs		Filtech / Southern Felt	0.0000055	9.43E-05	0%	2.1E-04	2.1E-04
Mill 2 (White ~~Gray~~ Mill)	D5	Mill 2 (White ~~Gray~~ Mill) and product collector	D-5	3,500	None	Irradiated PTFE	8,760	0.500	4,380	thousand lbs		Filtech / Southern Felt	0.0000055	3.30E-04	0%	7.2E-04	7.2E-04
	D8	Mill 2 product collector baghouse	D-8	3,900	None	Irradiated PTFE	8,760	0.500	4,380	thousand lbs		Filtech / Southern Felt	0.0000055	3.68E-04	0%	8.1E-04	8.1E-04
Mill 3	D3	Mill 3 product collector baghouse	D-3	950	None	Irradiated PTFE	8,760	0.054	473	thousand lbs		Filtech / Southern Felt	0.0000055	8.29E-04	0%	2.0E-04	2.0E-04
Mill 6	C1	Mill 6 product collector baghouse	C-1	1,045	None	Irradiated PTFE	8,760	0.040	350	thousand lbs	No pigmented material processed	GE PulsePleat	0.0025	0.560	0%	9.8E-02	9.8E-02
~~Mill 7~~	~~C5~~	Mill 7 has been permanently removed from service	~~C-5~~														
Mill 6 Feed Bin Product Collector	C6	Mill 6 Feed Bin Product Collector Baghouse	C-6	1,000	None	Irradiated PTFE	8,760	1	8,760	hours of operation			0.0025	0.0214	0%	0.094	0.094
Mill 8	C9	Mill 8 product collector baghouse	C-9	1,500	None	Irradiated PTFE	8,760	0.200	1,752	thousand lbs		Filtech / Southern Felt	0.0000055	0.000354	0%	3.1E-04	3.1E-04
Mill 9	C10	Mill 9 product collector baghouse	C-10	1,500	None	Irradiated PTFE	8,760	0.200	1,752	thousand lbs		Filtech / Southern Felt	0.0000055	0.000354	0%	3.1E-04	3.1E-04

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Shamrock Technologies, Inc.
Community Drive

11/12/2021

Process	Em Unit ID	Emission Unit	Stack ID	Stack Flow Rate (acfm)^1	Air Pollution Control Device	Maximum Throughputs^2					Throughput Notes	Collector Type	PM / PM_{10} Emissions				
						Operating Parameter	Max Hours (hrs/yr)	Hourly Rate (units/hr)	Annual Rate (units/yr)	Process Rate Units			Outlet PM (grains / ascf)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)
Mill 10	C12	Mill 10 product collector baghouse	C-12	1,500	None	Irradiated PTFE	8,760	0.200	1,752	thousand lbs		Filtech / Southern Felt	0.0000055	0.000354	0%	3.1E-04	3.1E-04
Dispersions 1 (Gray)	C3	Dispersions 1 process separator baghouse	C-3	1,050	None	Milled PTFE	8,760	0.500	4,380	thousand lbs			0.0025	0.0450	0%	0.099	0.099
	C7	Dispersions 1 oil heater (99,000 Btu/hr natural gas)	C-7		None	Natural gas	8,760	0.00010	0.850	MMft3 natural gas		NA		7.6	0%	0.0032	0.0032
Dispersions 2 (White)	C2	Dispersions 2 process separator baghouse	C-2	1,050	None	Milled PTFE	8,760	0.500	4,380	thousand lbs	No pigmented material processed		0.0025	0.0450	0%	0.099	0.099
	C8	Dispersions 2 oil heater (99,000 Btu/hr natural gas)	C-8		None	Natural gas	8,760	0.00010	0.850	MMft3 natural gas		NA		7.6	0%	0.0032	0.0032
~~Heated Processing Units (Two)~~	~~C11~~	Heated Processing Units have been removed from service	~~C-11~~														
Spray Chiller	A1	Spray chiller product collector baghouse	A-1		None	Milled polyethylene wax	8,760	0.110	964	thousand lbs		StaClean		1.00	0%	0.48	0.48
		Source Total														**3.7**	**3.7**

1 Flow rate given only where it is used to calculate PM emissions using outlet grain loading

2 Maximum annual throughput and associated emissions in some cases reflect inherent limitations on the supply of scrap PTFE

3 CO2 equivalent calculated using global warming potentials (GWP) taken from 40 CFR 98 Subpart A Table A-1 [79 FR 73779, Dec. 11, 2014]. GWP of CF4 is 7390, CH4 is 25, CO2 is 1, and N2O is 298

Process	**Em Unit ID**	**Emission Unit**	**Stack ID**	**Cobalt (HAP) Emissions**				**VOC Emissions**				**CO Emissions**			
				Emiss Factor (lb / process rate units)	**Control Efficiency (%)**	**Uncontrolled Emiss (ton/yr)**	**Controlled Emiss (ton/yr)**	**Emiss Factor (lb / process rate units)**	**Control Efficiency (%)**	**Uncontrolled Emiss (ton/yr)**	**Controlled Emiss (ton/yr)**	**Emiss Factor (lb / process rate units)**	**Control Efficiency (%)**	**Uncontrolled Emiss (ton/yr)**	**Controlled Emiss (ton/yr)**
ICT E-Beam	B1	ICT vault exhaust	B-1												
	B2	ICT window exhaust	B-2												
	B3-1	ICT product collector baghouses (three) - **PM emissions due to solids handling**	B-8												
	B3-2	ICT product collector baghouses (three) - **VOC emissions due to cutting oils**	B-8					7.00	0%	1.4	1.4				
	B3-3	ICT product collector baghouses (three) - **Emissions due to irradiation**	B-8					0.0642	0%	22.5	22.5	0.00334	0%	1.2	1.2
	B4	ICT process heater (1.2 MMBtu/hr natural gas)	B-4					5.5	0%	0.028	0.028	84	0%	0.43	0.43
E-Beam 3	B5	Vault exhaust	B-5												
	B6	Window exhaust	B-6												
	B7-1	Four material recovery devices (baghouses) - **PM emissions due to solids handling**	B-7												
	B7-2	Four material recovery devices (baghouses) - **VOC emissions due to cutting oils**	B-7					7.00	0%	1.4	1.4				
	B7-3	Four material recovery devices (baghouses) - **Emissions due to irradiation**	B-7					0.0642	0%	36.0	36.0	0.00334	0%	1.9	1.9

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Shamrock Technologies, Inc.
Community Drive

11/12/2021

Process	Em Unit ID	Emission Unit	Stack ID	Cobalt (HAP) Emissions				VOC Emissions				CO Emissions			
				Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)
Dynamitron E-Beam	D6-1	Dynamitron north vault exhaust (entrance side) - **VOC emissions due to cutting oils** - batch process - batch size is 968 lbs - cycle time is 114 minutes	D-6					25.00	0%	3.8	3.8				
	D6-2	Dynamitron north vault exhaust (entrance side) - **Emissions due to irradiation**	D-6					0.00115	0%	0.60	0.60	0.000288	0%	0.15	0.15
	D7-1	Dynamitron south vault exhaust (exit side) - **VOC emissions due to cutting oils** -batch process - batch size is 968 lbs - cycle time is 114 minutes	D-7					75.0	0%	11.3	11.3				
	D7-2	Dynamitron south vault exhaust (exit side) - **Emissions due to irradiation**	D-7					0.00390	0%	2.0	2.0	0.000921	0%	0.48	0.48
	D2-1 D10-1	Dynamitron product collector baghouses (two sets of three) - **PM emissions due to solids handling** - Collectors D2 and D10 do not operate simultaneously.	D-2 D-10												
	D2-2 D10-2	Dynamitron product collector baghouses (two sets of three) - **Cobalt emissions due to pigments**	D-2 D-10	1.16E-05	0%	1.7E-06	1.7E-06								
	D2-3 D10-3	Dynamitron product collector baghouses (two sets of three) - **Emissions due to irradiation** - batch process - batch size is 968 lbs - cycle time is 114 minutes. Collectors D2 and D10 do not operate simultaneously.	D-2 D-10					0.000260	0%	0.017	0.017	0.0000997	0%	0.0064	0.0064
~~ACM 1~~	~~E2~~	~~ACM 1 grinder product collector baghouse -~~ Moved to another facility													
ACM 2	E3	ACM 2 grinder product collector baghouse	E-3												
Tray Oven 1 (Blue Oven)	D9	Tray oven 1 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3					1.82	0%	0.40	0.40	0.0595	0%	0.013	0.013
Tray Oven 2	D11	Tray oven 2 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3					1.82	0%	0.40	0.40	0.0595	0%	0.013	0.013

Process	Em Unit ID	Emission Unit	Stack ID	Cobalt (HAP) Emissions				VOC Emissions				CO Emissions			
				Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)
Tray Oven 3	D12	Tray oven 3 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3					1.82	0%	0.40	0.40	0.0595	0%	0.013	0.013
Tray Oven 4	D13	Tray oven 4 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3					1.82	0%	0.40	0.40	0.0595	0%	0.013	0.013
Tray Ovens Vacuum Product Collectors (Three)	E4	Tray oven vacuum product collector baghouses - batch process - batch collected during one 30-minute period during each 24-hour batch for each oven. Each collector can only serve one oven at a time. Annual operation = 4 ovens x 0.5 hr / 24 hours x 8760 = 730 hr/yr	E-4												
Mill 1 (Gray ~~White~~ Mill)	D1	Mill 1 (Gray ~~White~~ Mill) and product collector	D-1												
	D4	Mill 1 product collector baghouse	D-4												
Mill 2 (White ~~Gray~~ Mill)	D5	Mill 2 (White ~~Gray~~ Mill) and product collector	D-5												
	D8	Mill 2 product collector baghouse	D-8												
Mill 3	D3	Mill 3 product collector baghouse	D-3												
Mill 6	C1	Mill 6 product collector baghouse	C-1												
~~Mill 7~~	~~C5~~	Mill 7 has been permanently removed from service	~~C-5~~												
Mill 6 Feed Bin Product Collector	C6	Mill 6 Feed Bin Product Collector Baghouse	C-6												
Mill 8	C9	Mill 8 product collector baghouse	C-9												
Mill 9	C10	Mill 9 product collector baghouse	C-10												

Process	Em Unit ID	Emission Unit	Stack ID	Cobalt (HAP) Emissions				VOC Emissions				CO Emissions			
				Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)
Mill 10	C12	Mill 10 product collector baghouse	C-12												
Dispersions 1 (Gray)	C3	Dispersions 1 process separator baghouse	C-3												
	C7	Dispersions 1 oil heater (99,000 Btu/hr natural gas)	C-7					5.5	0%	0.0023	0.0023	84	0%	0.036	0.036
Dispersions 2 (White)	C2	Dispersions 2 process separator baghouse	C-2												
	C8	Dispersions 2 oil heater (99,000 Btu/hr natural gas)	C-8					5.5	0%	0.0023	0.0023	84	0%	0.036	0.036
~~Heated Processing Units (Two)~~	~~C11~~	Heated Processing Units have been removed from service	~~C-11~~												
Spray Chiller	A1	Spray chiller product collector baghouse	A-1												
		Source Total				**1.7E-06**	**1.7E-06**			**80.5**	**80.5**			**4.24**	**4.24**

1 Flow rate given only where it is used to calculate PM emissions using outlet grain loading

2 Maximum annual throughput and associated emissions in some cases reflect inherent limitations on the supply of scrap PTFE

3 CO2 equivalent calculated using global warming potentials (GWP) taken from 40 CFR 98 Subpart A Table A-1 [79 FR 73779, Dec. 11, 2014]. GWP of CF4 is 7390, CH4 is 25, CO2 is 1, and N2O is 298

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Community Drive

11/12/2021

Process	Em Unit ID	Emission Unit	Stack ID	NOx Emissions				SO_2 Emissions				HF (HAP) Emissions			
				Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)
ICT E-Beam	B1	ICT vault exhaust	B-1									5.29E-05	0%	0.0186	0.0186
	B2	ICT window exhaust	B-2												
	B3-1	ICT product collector baghouses (three) - **PM emissions due to solids handling**	B-8												
	B3-2	ICT product collector baghouses (three) - **VOC emissions due to cutting oils**	B-8												
	B3-3	ICT product collector baghouses (three) - **Emissions due to irradiation**	B-8									0.02573	89.1%	9.02	0.983
	B4	ICT process heater (1.2 MMBtu/hr natural gas)	B-4	100	0%	0.52	0.52	0.6	0%	0.0031	0.0031				
E-Beam 3	B5	Vault exhaust	B-5									2.98E-05	0%	0.0167	0.0167
	B6	Window exhaust	B-6												
	B7-1	Four material recovery devices (baghouses) - **PM emissions due to solids handling**	B-7												
	B7-2	Four material recovery devices (baghouses) - **VOC emissions due to cutting oils**	B-7												
	B7-3	Four material recovery devices (baghouses) - **Emissions due to irradiation**	B-7									0.03261	92.5%	18.3	1.37

Process	**Em Unit ID**	**Emission Unit**	**Stack ID**	**NOx Emissions**				**SO_2 Emissions**				**HF (HAP) Emissions**			
				Emiss Factor (lb / process rate units)	**Control Efficiency (%)**	**Uncontrolled Emiss (ton/yr)**	**Controlled Emiss (ton/yr)**	**Emiss Factor (lb / process rate units)**	**Control Efficiency (%)**	**Uncontrolled Emiss (ton/yr)**	**Controlled Emiss (ton/yr)**	**Emiss Factor (lb / process rate units)**	**Control Efficiency (%)**	**Uncontrolled Emiss (ton/yr)**	**Controlled Emiss (ton/yr)**
Dynamitron E-Beam	D6-1	Dynamitron north vault exhaust (entrance side) - **VOC emissions due to cutting oils** - batch process - batch size is 968 lbs - cycle time is 114 minutes	D-6												
	D6-2	Dynamitron north vault exhaust (entrance side) - **Emissions due to irradiation**	D-6									0.0005456	0%	0.287	0.287
	D7-1	Dynamitron south vault exhaust (exit side) - **VOC emissions due to cutting oils** -batch process - batch size is 968 lbs - cycle time is 114 minutes	D-7												
	D7-2	Dynamitron south vault exhaust (exit side) - **Emissions due to irradiation**	D-7									0.0006702	0%	0.352	0.352
	D2-1 D10-1	Dynamitron product collector baghouses (two sets of three) - **PM emissions due to solids handling** - Collectors D2 and D10 do not operate simultaneously.	D-2 D-10												
	D2-2 D10-2	Dynamitron product collector baghouses (two sets of three) - **Cobalt emissions due to pigments**	D-2 D-10												
	D2-3 D10-3	Dynamitron product collector baghouses (two sets of three) - **Emissions due to irradiation** - batch process - batch size is 968 lbs - cycle time is 114 minutes. Collectors D2 and D10 do not operate simultaneously.	D-2 D-10									0.0001420	0%	0.0092	0.00916
~~ACM 1~~	~~E2~~	~~ACM 1 grinder product collector baghouse -~~ Moved to another facility													
ACM 2	E3	ACM 2 grinder product collector baghouse	E-3												
Tray Oven 1 (Blue Oven)	D9	Tray oven 1 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3									1.830	92.9%	0.401	0.0284
Tray Oven 2	D11	Tray oven 2 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3									1.830	92.9%	0.401	0.0284

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Shamrock Technologies, Inc.
Community Drive

11/12/2021

Process	Em Unit ID	Emission Unit	Stack ID	NOx Emissions				SO$_2$ Emissions				HF (HAP) Emissions			
				Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)
Tray Oven 3	D12	Tray oven 3 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3									1.830	92.9%	0.401	0.0284
Tray Oven 4	D13	Tray oven 4 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3									1.830	92.9%	0.401	0.0284
Tray Ovens Vacuum Product Collectors (Three)	E4	Tray oven vacuum product collector baghouses - batch process - batch collected during one 30-minute period during each 24-hour batch for each oven. Each collector can only serve one oven at a time. Annual operation = 4 ovens x 0.5 hr / 24 hours x 8760 = 730 hr/yr	E-4												
Mill 1 (Gray ~~White~~ Mill)	D1	Mill 1 (Gray ~~White~~ Mill) and product collector	D-1												
	D4	Mill 1 product collector baghouse	D-4												
Mill 2 (White ~~Gray~~ Mill)	D5	Mill 2 (White ~~Gray~~ Mill) and product collector	D-5												
	D8	Mill 2 product collector baghouse	D-8												
Mill 3	D3	Mill 3 product collector baghouse	D-3												
Mill 6	C1	Mill 6 product collector baghouse	C-1												
~~Mill 7~~	~~C5~~	Mill 7 has been permanently removed from service	~~C-5~~												
Mill 6 Feed Bin Product Collector	C6	Mill 6 Feed Bin Product Collector Baghouse	C-6												
Mill 8	C9	Mill 8 product collector baghouse	C-9												
Mill 9	C10	Mill 9 product collector baghouse	C-10												

AECOM

Shamrock Technologies, Inc.
Community Drive

11/12/2021

Process	Em Unit ID	Emission Unit	Stack ID	NOx Emissions				SO_2 Emissions				HF (HAP) Emissions			
				Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)
Mill 10	C12	Mill 10 product collector baghouse	C-12												
Dispersions 1 (Gray)	C3	Dispersions 1 process separator baghouse	C-3												
	C7	Dispersions 1 oil heater (99,000 Btu/hr natural gas)	C-7	100	0%	0.043	0.043	0.6	0%	0.00026	0.00026				
Dispersions 2 (White)	C2	Dispersions 2 process separator baghouse	C-2												
	C8	Dispersions 2 oil heater (99,000 Btu/hr natural gas)	C-8	100	0%	0.043	0.043	0.6	0%	0.00026	0.00026				
~~Heated Processing Units (Two)~~	~~C11~~	Heated Processing Units have been removed from service	~~C-11~~												
Spray Chiller	A1	Spray chiller product collector baghouse	A-1												
		Source Total				**0.60**	**0.60**			**0.0036**	**0.0036**			**29.6**	**3.15**

1 Flow rate given only where it is used to calculate PM emissions using outlet grain loading

2 Maximum annual throughput and associated emissions in some cases reflect inherent limitations on the supply of scrap PTFE

3 CO2 equivalent calculated using global warming potentials (GWP) taken from 40 CFR 98 Subpart A Table A-1 [79 FR 73779, Dec. 11, 2014]. GWP of CF4 is 7390, CH4 is 25, CO2 is 1, and N2O is 298

Process	Em Unit ID	Emission Unit	Stack ID	HCl (HAP) Emissions				Formaldehyde (HAP) Emissions				Carbon tetrafluoride (CF4) Emissions			
				Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)
ICT E-Beam	B1	ICT vault exhaust	B-1												
	B2	ICT window exhaust	B-2												
	B3-1	ICT product collector baghouses (three) - **PM emissions due to solids handling**	B-8												
	B3-2	ICT product collector baghouses (three) - **VOC emissions due to cutting oils**	B-8												
	B3-3	ICT product collector baghouses (three) - **Emissions due to irradiation**	B-8	0.0000677	0%	0.024	0.024	0.00004841	0%	0.017	0.017	0.00238	0%	0.83	0.83
	B4	ICT process heater (1.2 MMBtu/hr natural gas)	B-4									0	0%	0	0
E-Beam 3	B5	Vault exhaust	B-5												
	B6	Window exhaust	B-6												
	B7-1	Four material recovery devices (baghouses) - **PM emissions due to solids handling**	B-7												
	B7-2	Four material recovery devices (baghouses) - **VOC emissions due to cutting oils**	B-7												
	B7-3	Four material recovery devices (baghouses) - **Emissions due to irradiation**	B-7	0.0000677	0%	0.038	0.038	0.0000484	0%	0.027	0.027	0.00238	0%	1.3	1.3

Process	Em Unit ID	Emission Unit	Stack ID	HCl (HAP) Emissions				Formaldehyde (HAP) Emissions				Carbon tetrafluoride (CF4) Emissions			
				Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)
Dynamitron E-Beam	D6-1	Dynamitron north vault exhaust (entrance side) - **VOC emissions due to cutting oils** - batch process - batch size is 968 lbs - cycle time is 114 minutes	D-6												
	D6-2	Dynamitron north vault exhaust (entrance side) - **Emissions due to irradiation**	D-6	0.0000259	0%	0.014	0.014	0.0000259	0%	0.014	0.014	0.000117	0%	0.06	0.06
	D7-1	Dynamitron south vault exhaust (exit side) - **VOC emissions due to cutting oils** -batch process - batch size is 968 lbs - cycle time is 114 minutes	D-7												
	D7-2	Dynamitron south vault exhaust (exit side) - **Emissions due to irradiation**	D-7	0.0000198	0%	0.010	0.010	0.000257	0%	0.13	0.13	0.000594	0%	0.31	0.31
	D2-1 D10-1	Dynamitron product collector baghouses (two sets of three) - **PM emissions due to solids handling** - Collectors D2 and D10 do not operate simultaneously.	D-2 D-10												
	D2-2 D10-2	Dynamitron product collector baghouses (two sets of three) - **Cobalt emissions due to pigments**	D-2 D-10												
	D2-3 D10-3	Dynamitron product collector baghouses (two sets of three) - **Emissions due to irradiation** - batch process - batch size is 968 lbs - cycle time is 114 minutes. Collectors D2 and D10 do not operate simultaneously.	D-2 D-10	0	0%	0	0	0	0%	0	0	0.000152	0%	0.0098	0.0098
~~ACM 1~~	~~E2~~	~~ACM 1 grinder product collector baghouse -~~ Moved to another facility													
ACM 2	E3	ACM 2 grinder product collector baghouse	E-3												
Tray Oven 1 (Blue Oven)	D9	Tray oven 1 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3	0.00275	0%	0.00060	0.00060					0.0267	0%	0.0058	0.0058
Tray Oven 2	D11	Tray oven 2 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3	0.00275	0%	0.00060	0.00060					0.0267	0%	0.0058	0.0058

Process	Em Unit ID	Emission Unit	Stack ID	HCl (HAP) Emissions				Formaldehyde (HAP) Emissions				Carbon tetrafluoride (CF4) Emissions			
				Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)
Tray Oven 3	D12	Tray oven 3 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3	0.00275	0%	0.00060	0.00060					0.0267	0%	0.0058	0.0058
Tray Oven 4	D13	Tray oven 4 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3	0.00275	0%	0.00060	0.00060					0.0267	0%	0.0058	0.0058
Tray Ovens Vacuum Product Collectors (Three)	E4	Tray oven vacuum product collector baghouses - batch process - batch collected during one 30-minute period during each 24-hour batch for each oven. Each collector can only serve one oven at a time. Annual operation = 4 ovens x 0.5 hr / 24 hours x 8760 = 730 hr/yr	E-4												
Mill 1 (Gray ~~White~~ Mill)	D1	Mill 1 (Gray ~~White~~ Mill) and product collector	D-1												
	D4	Mill 1 product collector baghouse	D-4												
Mill 2 (White ~~Gray~~ Mill)	D5	Mill 2 (White ~~Gray~~ Mill) and product collector	D-5												
	D8	Mill 2 product collector baghouse	D-8												
Mill 3	D3	Mill 3 product collector baghouse	D-3												
Mill 6	C1	Mill 6 product collector baghouse	C-1												
~~Mill 7~~	~~C5~~	Mill 7 has been permanently removed from service	~~C-5~~												
Mill 6 Feed Bin Product Collector	C6	Mill 6 Feed Bin Product Collector Baghouse	C-6												
Mill 8	C9	Mill 8 product collector baghouse	C-9												
Mill 9	C10	Mill 9 product collector baghouse	C-10												

11/12/2021

Process	Em Unit ID	Emission Unit	Stack ID	HCl (HAP) Emissions				Formaldehyde (HAP) Emissions				Carbon tetrafluoride (CF4) Emissions			
				Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)
Mill 10	C12	Mill 10 product collector baghouse	C-12												
Dispersions 1 (Gray)	C3	Dispersions 1 process separator baghouse	C-3												
	C7	Dispersions 1 oil heater (99,000 Btu/hr natural gas)	C-7									0	0%	0	0
Dispersions 2 (White)	C2	Dispersions 2 process separator baghouse	C-2												
	C8	Dispersions 2 oil heater (99,000 Btu/hr natural gas)	C-8									0	0%	0	0
~~Heated Processing Units (Two)~~	~~C11~~	Heated Processing Units have been removed from service	~~C-11~~												
Spray Chiller	A1	Spray chiller product collector baghouse	A-1												
		Source Total				0.088	0.088			0.19	0.19			2.6	2.6
								Total HAP		29.9	3.4				

1 Flow rate given only where it is used to calculate PM emissions using outlet grain loading

2 Maximum annual throughput and associated emissions in some cases reflect inherent limitations on the supply of scrap PTFE

3 CO2 equivalent calculated using global warming potentials (GWP) taken from 40 CFR 98 Subpart A Table A-1 [79 FR 73779, Dec. 11, 2014]. GWP of CF4 is 7390, CH4 is 25, CO2 is 1, and N2O is 298

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11/12/2021

Process	Em Unit ID	Emission Unit	Stack ID	Methane (CH4) Emissions				Carbon dioxide (CO2) Emissions				Nitrous oxide (N2O) Emissions			
				Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)
ICT E-Beam	B1	ICT vault exhaust	B-1												
	B2	ICT window exhaust	B-2												
	B3-1	ICT product collector baghouses (three) - **PM emissions due to solids handling**	B-8												
	B3-2	ICT product collector baghouses (three) - **VOC emissions due to cutting oils**	B-8												
	B3-3	ICT product collector baghouses (three) - **Emissions due to irradiation**	B-8	0.000431	0%	0.15	0.15	0.314	0%	110.2	110.2	0.000681	0%	0.24	0.24
	B4	ICT process heater (1.2 MMBtu/hr natural gas)	B-4	2.3	0%	0.012	0.012	120,000	0%	618.4	618.4	2.2	0%	0.011	0.011
E-Beam 3	B5	Vault exhaust	B-5												
	B6	Window exhaust	B-6												
	B7-1	Four material recovery devices (baghouses) - **PM emissions due to solids handling**	B-7												
	B7-2	Four material recovery devices (baghouses) - **VOC emissions due to cutting oils**	B-7												
	B7-3	Four material recovery devices (baghouses) - **Emissions due to irradiation**	B-7	0.000431	0%	0.24	0.24	0.314	0%	176.3	176.3	0.000681	0%	0.38	0.38

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11/12/2021

Process	Em Unit ID	Emission Unit	Stack ID	Methane (CH4) Emissions				Carbon dioxide (CO2) Emissions				Nitrous oxide (N2O) Emissions			
				Emiss Factor (lb / process rate units)	**Control Efficiency (%)**	**Uncontrolled Emiss (ton/yr)**	**Controlled Emiss (ton/yr)**	**Emiss Factor (lb / process rate units)**	**Control Efficiency (%)**	**Uncontrolled Emiss (ton/yr)**	**Controlled Emiss (ton/yr)**	**Emiss Factor (lb / process rate units)**	**Control Efficiency (%)**	**Uncontrolled Emiss (ton/yr)**	**Controlled Emiss (ton/yr)**
Dynamitron E-Beam	D6-1	Dynamitron north vault exhaust (entrance side) - **VOC emissions due to cutting oils** - batch process - batch size is 968 lbs - cycle time is 114 minutes	D-6												
	D6-2	Dynamitron north vault exhaust (entrance side) - **Emissions due to irradiation**	D-6	0.000799	0%	0.42	0.42	0.403	0%	211.6	211.6	0.000436	0%	0.23	0.23
	D7-1	Dynamitron south vault exhaust (exit side) - **VOC emissions due to cutting oils** -batch process - batch size is 968 lbs - cycle time is 114 minutes	D-7												
	D7-2	Dynamitron south vault exhaust (exit side) - **Emissions due to irradiation**	D-7	0.000767	0%	0.40	0.40	0.374	0%	196.4	196.4	0.000527	0%	0.28	0.28
	D2-1 D10-1	Dynamitron product collector baghouses (two sets of three) - **PM emissions due to solids handling** - Collectors D2 and D10 do not operate simultaneously.	D-2 D-10												
	D2-2 D10-2	Dynamitron product collector baghouses (two sets of three) - **Cobalt emissions due to pigments**	D-2 D-10												
	D2-3 D10-3	Dynamitron product collector baghouses (two sets of three) - **Emissions due to irradiation** - batch process - batch size is 968 lbs - cycle time is 114 minutes. Collectors D2 and D10 do not operate simultaneously.	D-2 D-10	0.000174	0%	0.0112	0.0112	0.0978	0%	6.3	6.3	0.0000705	0%	0.0046	0.0046
~~ACM 1~~	~~E2~~	~~ACM 1 grinder product collector baghouse -~~ Moved to another facility													
ACM 2	E3	ACM 2 grinder product collector baghouse	E-3												
Tray Oven 1 (Blue Oven)	D9	Tray oven 1 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3	0.0337	0%	0.0074	0.0074	14.7	0%	3.2	3.2	0.0101	0%	0.0022	0.0022
Tray Oven 2	D11	Tray oven 2 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3	0.0337	0%	0.0074	0.0074	14.7	0%	3.2	3.2	0.0101	0%	0.0022	0.0022

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11/12/2021

Process	Em Unit ID	Emission Unit	Stack ID	Methane (CH4) Emissions				Carbon dioxide (CO2) Emissions				Nitrous oxide (N2O) Emissions			
				Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)
Tray Oven 3	D12	Tray oven 3 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3	0.0337	0%	0.0074	0.0074	14.7	0%	3.2	3.2	0.0101	0%	0.0022	0.0022
Tray Oven 4	D13	Tray oven 4 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3	0.0337	0%	0.0074	0.0074	14.7	0%	3.2	3.2	0.0101	0%	0.0022	0.0022
Tray Ovens Vacuum Product Collectors (Three)	E4	Tray oven vacuum product collector baghouses - batch process - batch collected during one 30-minute period during each 24-hour batch for each oven. Each collector can only serve one oven at a time. Annual operation = 4 ovens x 0.5 hr / 24 hours x 8760 = 730 hr/yr	E-4												
Mill 1 (Gray ~~White~~ Mill)	D1	Mill 1 (Gray ~~White~~ Mill) and product collector	D-1												
	D4	Mill 1 product collector baghouse	D-4												
Mill 2 (White ~~Gray~~ Mill)	D5	Mill 2 (White ~~Gray~~ Mill) and product collector	D-5												
	D8	Mill 2 product collector baghouse	D-8												
Mill 3	D3	Mill 3 product collector baghouse	D-3												
Mill 6	C1	Mill 6 product collector baghouse	C-1												
~~Mill 7~~	~~C5~~	Mill 7 has been permanently removed from service	~~C-5~~												
Mill 6 Feed Bin Product Collector	C6	Mill 6 Feed Bin Product Collector Baghouse	C-6												
Mill 8	C9	Mill 8 product collector baghouse	C-9												
Mill 9	C10	Mill 9 product collector baghouse	C-10												

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11/12/2021

Process	Em Unit ID	Emission Unit	Stack ID	Methane (CH4) Emissions				Carbon dioxide (CO2) Emissions				Nitrous oxide (N2O) Emissions			
				Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)
Mill 10	C12	Mill 10 product collector baghouse	C-12												
Dispersions 1 (Gray)	C3	Dispersions 1 process separator baghouse	C-3												
	C7	Dispersions 1 oil heater (99,000 Btu/hr natural gas)	C-7	2.3	0%	0.00098	0.00098	120,000	0%	51.0	51.0	2.2	0%	0.00094	0.00094
Dispersions 2 (White)	C2	Dispersions 2 process separator baghouse	C-2												
	C8	Dispersions 2 oil heater (99,000 Btu/hr natural gas)	C-8	2.3	0%	0.00098	0.00098	120,000	0%	51.0	51.0	2.2	0%	0.00094	0.00094
~~Heated Processing Units (Two)~~	~~C11~~	Heated Processing Units have been removed from service	~~C-11~~												
Spray Chiller	A1	Spray chiller product collector baghouse	A-1												
		Source Total				**1.3**	**1.3**			**1,434**	**1,434**			**1.2**	**1.2**

1 Flow rate given only where it is used to calculate PM emissions using outlet grain loading

2 Maximum annual throughput and associated emissions in some cases reflect inherent limitations on the supply of scrap PTFE

3 CO2 equivalent calculated using global warming potentials (GWP) taken from 40 CFR 98 Subpart A Table A-1 [79 FR 73779, Dec. 11, 2014]. GWP of CF4 is 7390, CH4 is 25, CO2 is 1, and N2O is 298

Process	**Em Unit ID**	**Emission Unit**	**Stack ID**	**Greenhouse Gases (CO_2 equivalent Basis)[3]**		**Emission Factor Basis**
				Uncontrolled Emiss (ton/yr)	**Controlled Emiss (ton/yr)**	
ICT E-Beam	B1	ICT vault exhaust	B-1			PM and HF emissions based on 2019 testing
	B2	ICT window exhaust	B-2			
	B3-1	ICT product collector baghouses (three) - **PM emissions due to solids handling**	B-8			Assume outlet PM is 0.0025 grains/scf. Worst-case stack flow rate used for PM calculations. Flow rate from Dec-2017 test was lower.
	B3-2	ICT product collector baghouses (three) - **VOC emissions due to cutting oils**	B-8			Shavings cutting oil content assumed 0.7 wt%, all emitted as VOC
	B3-3	ICT product collector baghouses (three) - **Emissions due to irradiation**	B-8	6,351	6,351	HF uncontrolled factor from Dec-2017 test result of 1.85 lb/hr inlet HF at 71.9 kw-hr rate. HF control 89.1% per Dec-2017 test. HF emissions at 80 kw-hr capacity. Other emission factors from Apr-2009 test (worst-case is steady state).
	B4	ICT process heater (1.2 MMBtu/hr natural gas)	B-4	622	622	U.S. EPA AP-42 Tables 1.4-1 (07/98) and 1.4-2 (07/98), natural gas heat content 1,020 Btu/scf
E-Beam 3	B5	Vault exhaust	B-5			PM and HF emissions based on 2019 testing
	B6	Window exhaust	B-6			
	B7-1	Four material recovery devices (baghouses) - **PM emissions due to solids handling**	B-7			Assume outlet PM is 0.0025 grains/scf. Flow rate (acfm) from Dec-2017 test report, scrubber outlet for worst-case flow
	B7-2	Four material recovery devices (baghouses) - **VOC emissions due to cutting oils**	B-7			Shavings cutting oil content assumed 0.7 wt%, all emitted as VOC
	B7-3	Four material recovery devices (baghouses) - **Emissions due to irradiation**	B-7	10,162	10,162	HF uncontrolled factor from Dec-2017 test result of 3.01 lb/hr inlet HF at 92.3 kw-hr rate. HF control 92.5% per Dec-2017 test. HF emissions at 128 kw-hr capacity. Other emission factors from Apr-2009 ICT E-Beam test (worst-case is steady state)

11/12/2021

Process	**Em Unit ID**	**Emission Unit**	**Stack ID**	**Greenhouse Gases (CO$_2$ equivalent Basis)[3]**		**Emission Factor Basis**
				Uncontrolled Emiss (ton/yr)	**Controlled Emiss (ton/yr)**	
Dynamitron E-Beam	D6-1	Dynamitron north vault exhaust (entrance side) - **VOC emissions due to cutting oils** - batch process - batch size is 968 lbs - cycle time is 114 minutes	D-6			Heels/cones isopar oil content assumed 10 wt%, all emitted as VOC. Assume 25% emitted at north vault exhaust and 75% at south vault exhaust.
	D6-2	Dynamitron north vault exhaust (entrance side) - **Emissions due to irradiation**	D-6	743	743	Emission factors from Apr-2009 test
	D7-1	Dynamitron south vault exhaust (exit side) - **VOC emissions due to cutting oils** -batch process - batch size is 968 lbs - cycle time is 114 minutes	D-7			Heels/cones isopar oil content assumed 10 wt%, all emitted as VOC. Assume 25% emitted at north vault exhaust and 75% at south vault exhaust.
	D7-2	Dynamitron south vault exhaust (exit side) - **Emissions due to irradiation**	D-7	2,598	2,598	Emission factors from Apr-2009 test
	D2-1 D10-1	Dynamitron product collector baghouses (two sets of three) - **PM emissions due to solids handling** - Collectors D2 and D10 do not operate simultaneously.	D-2 D-10			Assume outlet PM is 0.0025 grains/scf. Flow rate from Apr-2009 test. Assumed all isopar oil already emitted through vault exhausts.
	D2-2 D10-2	Dynamitron product collector baghouses (two sets of three) - **Cobalt emissions due to pigments**	D-2 D-10			Cobalt is approx 5 wt% of pigmented scrap, at 5 wt% cobalt content.
	D2-3 D10-3	Dynamitron product collector baghouses (two sets of three) - **Emissions due to irradiation** - batch process - batch size is 968 lbs - cycle time is 114 minutes. Collectors D2 and D10 do not operate simultaneously.	D-2 D-10	80	80	Emission factors from Apr-2009 test. No HCl or formaldehyde detected.
~~ACM 1~~	~~E2~~	~~ACM 1 grinder product collector baghouse -~~ Moved to another facility				
ACM 2	E3	ACM 2 grinder product collector baghouse	E-3			Filtech manufacturer testing P84-13 result of 0.0000055 gr/dscf PM Total
Tray Oven 1 (Blue Oven)	D9	Tray oven 1 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3	47	47	Uncontrolled emission factors from Apr-2009 test. Scrubber HF control of 92.9% from Dec-2017 test. Formaldehyde not detected. PM factor from 3/27/2019 Scrubber 1 inlet test result of 0.336 lb/hr total for three ovens baking a total of 2890 lbs for 13.4 hours. PM EF = 0.336 / 2890 / 1000 / 13.4. No credit taken for scrubber PM control.
Tray Oven 2	D11	Tray oven 2 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3	47	47	Uncontrolled emission factors from Apr-2009 test of Blue Tray Oven. Scrubber HF control of 92.9% from Dec-2017 test. Formaldehyde not detected. PM factor from 3/27/2019 Scrubber 1 inlet test result of 0.336 lb/hr total for three ovens baking a total of 2890 lbs for 13.4 hours. PM EF = 0.336 / 2890 / 1000 / 13.4. No credit taken for scrubber PM control.

Process	Em Unit ID	Emission Unit	Stack ID	Greenhouse Gases (CO$_2$ equivalent Basis)[3]		Emission Factor Basis
				Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	
Tray Oven 3	D12	Tray oven 3 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3	47	47	Uncontrolled emission factors from Apr-2009 test of Blue Tray Oven. Scrubber HF control of 92.9% from Dec-2017 test. Formaldehyde not detected. PM factor from 3/27/2019 Scrubber 1 inlet test result of 0.336 lb/hr total for three ovens baking a total of 2890 lbs for 13.4 hours. PM EF = 0.336 / 2890 / 1000 / 13.4. No credit taken for scrubber PM control.
Tray Oven 4	D13	Tray oven 4 exhaust - batch process - worst-case is 1200 lb batch charge and 24 hour cycle time	B-3	47	47	Uncontrolled emission factors from Apr-2009 test of Blue Tray Oven. Scrubber HF control of 92.9% from Dec-2017 test. Formaldehyde not detected. PM factor from 3/27/2019 Scrubber 1 inlet test result of 0.336 lb/hr total for three ovens baking a total of 2890 lbs for 13.4 hours. PM EF = 0.336 / 2890 / 1000 / 13.4. No credit taken for scrubber PM control.
Tray Ovens Vacuum Product Collectors (Three)	E4	Tray oven vacuum product collector baghouses - batch process - batch collected during one 30-minute period during each 24-hour batch for each oven. Each collector can only serve one oven at a time. Annual operation = 4 ovens x 0.5 hr / 24 hours x 8760 = 730 hr/yr	E-4			Assume outlet PM is 0.0025 grains/scf. Assume all HF baked off in oven.
Mill 1 (Gray ~~White~~ Mill)	D1	Mill 1 (Gray ~~White~~ Mill) and product collector	D-1			Filtech manufacturer testing P84-13 result of 0.0000055 gr/dscf PM Total. Assume cobalt accounted for in other processing steps.
	D4	Mill 1 product collector baghouse	D-4			Filtech manufacturer testing P84-13 result of 0.0000055 gr/dscf PM Total. Assume cobalt accounted for in other processing steps.
Mill 2 (White ~~Gray~~ Mill)	D5	Mill 2 (White ~~Gray~~ Mill) and product collector	D-5			Filtech manufacturer testing P84-13 result of 0.0000055 gr/dscf PM Total. Assume cobalt accounted for in other processing steps.
	D8	Mill 2 product collector baghouse	D-8			Filtech manufacturer testing P84-13 result of 0.0000055 gr/dscf PM Total. Assume cobalt accounted for in other processing steps.
Mill 3	D3	Mill 3 product collector baghouse	D-3			Filtech manufacturer testing P84-13 result of 0.0000055 gr/dscf PM Total. Assume cobalt accounted for in other processing steps.
Mill 6	C1	Mill 6 product collector baghouse	C-1			GE BHA PulsePleat spunbound polyester PM outlet specification of 0.0025 grains/acf
~~Mill 7~~	~~C5~~	Mill 7 has been permanently removed from service	~~C-5~~			
Mill 6 Feed Bin Product Collector	C6	Mill 6 Feed Bin Product Collector Baghouse	C-6			Assume outlet PM is 0.0025 grains/scf. Assume cobalt accounted for in other processing steps.
Mill 8	C9	Mill 8 product collector baghouse	C-9			Filtech manufacturer testing P84-13 result of 0.0000055 gr/dscf PM Total. Assume cobalt accounted for in other processing steps.
Mill 9	C10	Mill 9 product collector baghouse	C-10			Filtech manufacturer testing P84-13 result of 0.0000055 gr/dscf PM Total. Assume cobalt accounted for in other processing steps.

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11/12/2021

Process	Em Unit ID	Emission Unit	Stack ID	Greenhouse Gases (CO_2 equivalent Basis)[3]		Emission Factor Basis
				Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	
Mill 10	C12	Mill 10 product collector baghouse	C-12			Filtech manufacturer testing P84-13 result of 0.0000055 gr/dscf PM Total. Assume cobalt accounted for in other processing steps.
Dispersions 1 (Gray)	C3	Dispersions 1 process separator baghouse	C-3			Assume outlet PM is 0.0025 grains/scf. Assume cobalt accounted for in other processing steps.
	C7	Dispersions 1 oil heater (99,000 Btu/hr natural gas)	C-7	51	51	U.S. EPA AP-42 Tables 1.4-1 (07/98) and 1.4-2 (07/98), natural gas heat content 1,020 Btu/scf
Dispersions 2 (White)	C2	Dispersions 2 process separator baghouse	C-2			Assume outlet PM is 0.0025 grains/scf
	C8	Dispersions 2 oil heater (99,000 Btu/hr natural gas)	C-8	51	51	U.S. EPA AP-42 Tables 1.4-1 (07/98) and 1.4-2 (07/98), natural gas heat content 1,020 Btu/scf
~~Heated Processing Units (Two)~~	~~C11~~	Heated Processing Units have been removed from service	~~C-11~~			
Spray Chiller	A1	Spray chiller product collector baghouse	A-1			StaClean PM0.5 emissions guarantee of 99.9%
		Source Total		**20,848**	**20,848**	**Total Source Emissions**

1 Flow rate given only where it is used to calculate PM emissions using outlet grain loading

2 Maximum annual throughput and associated emissions in some cases reflect inherent limitations on the supply of scrap PTFE

3 CO2 equivalent calculated using global warming potentials (GWP) taken from 40 CFR 98 Subpart A Table A-1 [79 FR 73779, Dec. 11, 2014]. GWP of CF4 is 7390, CH4 is 25, CO2 is 1, and N2O is 298

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June 22, 2022

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Kentucky Division for Air Quality
300 Sower Boulevard
Frankfort, Kentucky 40601

Re: Shamrock Technologies, Inc.
Permit No. F-16-012 R1
AI No. 46709
502(b)(10) Change Notification, Mills 2, 8 and 10

Dear Mr. Kennedy,

Please find attached a Section 502(b)(10) for the above referenced permit submitted pursuant to 401 KAR 52:030 Section 17(2)(b). Per our discussions, this change notification is being submitted simultaneously with an Interim Measures Proposal in accordance with Agreed Order DOW-19-2-009 for reduction of PFAS emissions in operations at the Shamrock Technologies, Inc. (Shamrock) Community Drive facility. A copy of the Interim Measures Proposal is included.

We appreciate the Division's direction in working through these difficult issues in moving forward with control measures to reduce PFAS air emissions as expeditiously as possible.

We have edited the previously submitted draft submittal per your request, and are planning on moving forward with the change within 7 business days of this submittal unless we hear otherwise from the Division. If you have any questions regarding this 502(b)(10) change package, please do not hesitate to contact me.

Sincerely,

Michael Jussila

Michael Jussila
Global Manufacturing and Engineering Leader

cc: Tony Hatton (KDEP)
Larry Hughes (KDEP)
Rick Shewekah (KDAQ)
Craig Collins (Shamrock)

Attachment 1 – 502(b)(10) Change Description
Attachment 2 – Bag Filter Specification and Evaluation
Attachment 3 – Jet Mill Filtration Efficiency Information
Attachment 4 – Particulate Emission Calculations
Attachment 5 – DEP7007 Permit Application Forms
Attachment 6 – Interim Measures Proposal

Attachment 1
Section 502(b)(10) Change Description

Shamrock Technologies, Inc.
Community Drive Facility
Permit No. F-16-012 R1
502(b)(10) Change Notification
June 22, 2022

Shamrock Technologies, Inc. (Shamrock) voluntarily entered into Agreed Order DOW-19-2-0069 with the Energy and Environment Cabinet (the Cabinet) on November 1, 2019 for settlement of all alleged violations and deficiencies related to its voluntary disclosure of discovery of Per- and Poly- Flurol-Alkylated Substances (PFAS) found in soil and groundwater samples. Pursuant to the Agreed Order, Shamrock has engaged in on- and off-site characterization, including conducting an inventory of PFAS air emission sources. Shamrock has agreed to conduct certain interim measures to control air emissions at the Community Drive facility, including replacement of select existing mills with more efficient mills to reduce PFAS emissions.

Mills at Community Drive are listed Insignificant Activities in Permit F-16-012 subject to 410 KAR 59:010. Particulate Matter (PM) is the regulated pollutant emitted by mills under the Clean Air Act (CAA). PFAS is neither a regulated pollutant or hazardous air pollutant under the CAA at this time.

Shamrock is submitting this 502(b)(10) change notification to the Division for Air Quality (the Division) pursuant to 401 KAR 52:030 Section 17(2)(b) regarding impacts on PM emissions. Simultaneously, Shamrock is submitting to the Department of Environmental Protection (the Department) a Draft Interim Measure Proposal for replacement of the select mills pursuant to the Agreed Order for reduction of PFAS emissions. A copy of the Interim Measure Proposal is provided at Attachment 6.

This change is not a modification under Title I of the CAA and emissions will not exceed any emissions allowed under the permit. 401 KAR 52:30 Section 17(2)(a). This notification is being submitted at least seven work days in advance of the change.

Brief description of each change:

Mill 2 will be replaced with a Hosokawa model 710 mill. Mills 8 and 10 will be replaced with Hosokawa model 630 mills.

Mills are utilized to break PTFE into particles to be processed for use by specific customers. The customer use dictates the size of particle to be processed. Mill 2 was installed in 1998; Mills 8 and 10 were installed in the early 2000's. Mill design has significantly evolved since that time. New Hosokawa mills are more precise in their ability to consistently and quickly produce particles at the desired size. Desired sizes are usually greater than 1 micron. The old mills were not concise and produced particles at varying sizes, including more particles less than 1 micron. Also, the existing mill design results in particles remaining in the mills (resonance time) longer which can result in particle size that is smaller than desired, specifically less than 1 micron. The new Hosokawa mills reduce resonance time and thus reduce the number of particles less than 1 micron.

Date on which the change will occur:

Mill 2: August 2022 startup
Mill 8: January 2023 startup
Mill 10: December 2022 startup

These dates are subject to delays in supply and equipment receipt.

Any change in emissions that will occur:

As stated above, Shamrock is replacing existing Mills 2, 8 and 10 with Hosakawa Mills that use newer and more efficient milling technology. The maximum permitted capacity (pounds milled per hour) of the replacement mills will be the same as the existing mills.

Existing Mill 2 has two vents, a mill vent and a product collector vent. Each of these vents is equipped with a baghouse. These baghouses are used to separate product from conveying air and are necessary for product recovery. Therefore, the baghouses are product collection devices and not air pollution control devices. Therefore, emissions from the baghouse vents represent uncontrolled, controlled and potential emissions (because there is no air pollution control device).

The replacement Hosakawa mill for Mill 2 will have only one vent, the product collector vent. This will eliminate one emission point (D-5, Mill 2 Mill Vent) and the associated 2.19 ton/yr of potential particulate emissions from the baghouse vent.

Existing Mills 8 and 10 have only a product collector vent each (no separate mill vent) and will be replaced with Hosakawa mills with a product collector vent each. The product collector vents on these mills are equipped with baghouses. These baghouses are used to separate product from conveying air and are necessary for product recovery. Therefore, the baghouses are product collection devices and not air pollution control devices. Therefore, emissions from the baghouse vents represent uncontrolled, controlled and potential emissions (because there is no air pollution control device).

Air pollution control device is defined at 401 KAR 52:001 Section 1(11) as

> "Air pollution control equipment" means a mechanism, device, or contrivance used to control or prevent air pollution, that is not, aside from air pollution control laws and administrative regulations, vital to production of the normal product of the source or to its normal operation.

The baghouses are vital to the normal operation of this source. The baghouses are the sole product recovery device for the milling process, and without the baghouses the product could not be separated from the conveying air. Without the baghouses, Shamrock would not be able to produce any product since all material would be lost out the vents. Further guidance on air pollution control devices versus process equipment can be found in the Compliance Assurance Monitoring regulation, 40 CFR Part 64. The definition of "control device" at 40 CFR 64.1 excludes "inherent process equipment". Inherent process equipment is defined at 40 CFR 64.1 as "equipment that is necessary for the proper or safe functioning of the process, or material recovery equipment that the owner or operator documents is installed and operated primarily for purposes other than compliance with air pollution regulations.... For the purpose of this part, inherent process equipment is not considered a control device."

The baghouses are inherent process equipment because they are material recovery equipment that is installed and operated to recover product. Without the baghouses no product would be recovered.

The existing mills baghouses currently use Summit Filter P84 bags, with a manufacturer specified nominal efficiency of 99.99% particulate removal for particles greater than 1 micron. The replacement mills will use the same baghouses and identical filter bags. Emissions from the existing mills were estimated by multiplying the milling rate (pounds milled) by the product collector baghouse filter removal efficiency (1 – 99.9%) to estimate particulate emissions.[1] Note that although the manufacturer rating for the bags is 99.99% removal, Shamrock is conservatively using only 99.9% removal in the potential emission calculations (resulting in a PTE which is conservatively 10 times greater than would be estimated using the 99.99% rating).[2]

In addition to eliminating the Mill 2 Mill vent, the replacement mill project is expected to achieve additional emission reductions due to the improved milling technology used by the new Hosakawa mills. These additional expected emission reductions are due to:

- Less milling air used (i.e., the same amount of material will be milled using significant less milling air)
- The lower milling air rates will result in lower exhaust flow rates and therefore lower air to cloth ratios, which are expected to improve the baghouse removal efficiency
- The Hosokawa mills produce more accurately sized materials with a particle size distribution much closer to the target diameters, with fewer of the smaller (less than 1 micron) particles that are not desired in the Shamrock products. Because the replacement mills will produce fewer particles less than 1 micron, a higher percentage of particles is expected to be captured by the filters.

It is difficult to precisely quantify the emissions reduction achieved by these above factors so this application does not take credit for any emissions reductions other than from the elimination of the Mill 2 Mill Vent (Emission Point D-5). However, based on engineering judgement Shamrock believes that there will be particulate emissions reductions from the remaining vents..

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[1] Historically, mill particulate emissions were estimated using a filter grain loading and blower air flow rating. These historic estimates were used to demonstrate that each mill qualifies as an Insignificant Activity and were not updated when the existing filters were replaced with more efficient P84 bags, since the bag change led to reduced emissions. Filter grain loading is not provided by the manufacturer for the P84 bags. Instead, the manufacturer provides a removal efficiency rating. Therefore, the particulate emission calculation basis for this application for Mills 2, 8 and 10 is being revised to use the bag particulate removal efficiency.

[2] The baghouses operate within the manufacturer specified parameter. The only parameter that the bag filter manufacturer provides is nominal air permeability (cfm/ft2). Attachment 2 provides the filter manufacturer specification sheet and a calculation of the air to filter ratio (cfm/ft2) demonstrating that it does not exceed the manufacture specification. Attachment 3 further responds to questions raised by KDAQ regarding the efficiency of the product collector at lower flow velocity.

Particulate Emissions Change

Known Emission Reductions

Emission Point	Description	Current PTE		PTE after Replacement with Hosakawa Mills		PTE Change
		Lb/hr	**Ton/yr**	**Lb/hr**	**Ton/yr**	**Ton/yr**
D-5	Mill 2 Mill Vent[1]	0.50	2.19	No mill vent		**-2.19**

1. Replacement Mill 2 will only have one emission point. Mill vent will not exist in new configuration.

Detailed emission calculations are provided at Attachment 4.

<u>Any permit term or condition that will no longer be applicable after the change:</u>

No permit term or condition will no longer be applicable after the change.

Forms 7007 AI and DD are provided at Attachment 5.

Attachment 2
Bag Filter Specification and Evaluation

Bag Filter Specification

FILTER
HOLDINGS
Specialists in High Performance Filters
20 Milltown Rd.
Union, NJ 07083
(908) 697-3500

SUMMIT FILTER S/924-60

Material Specifications for

16 oz. P84 with Teflon Finish

Fiber Content :	**100% Polyimide – Polyamid Proprietary Blend**
Construction :	**Needle Punched Felt**
Scrim :	**PTFE**
Surface Finish :	**Fully Cured Multi-Layered Microcellular Teflon Coating**
Nominal Weight :	**16 oz./sq. yard**
Nominal Burst Strength :	**500 lbs/sq. inch Minimum**
Nominal Air Permeability:	**25-35 CFM/sq. foot**
Nominal Efficiency :	**99.99% for particles Greater than one micron**
Temperature Limit :	**460°F Continuous**

Actual Air to Cloth Ratios

Air to cloth ratios for current are replacement mills are less than the maximum permeability of the filter material.

Mill 2 Current and Hosokawa Replacement 710	**Air to Cloth Ratio (CFM/ft2 = ft/min)**	**ft2 of Cloth**	**CFM**
Community Mill 2 **Vent**	3.6	1395.4	4958.0
Community Mill 2 **Product Collector**	1.9	980.2	1838.0
Hosokawa 710 Mill ***eliminates vent*** but keeps P**roduct Collector**	1.7	980.2	1643.0
Mill 8 Current and Hosokawa Replacement 630	**Air to Cloth Ratio (CFM/ft2 = ft/min)**	**ft2 of Cloth**	**CFM**
Community Mill 8 **Product Collector**	2.0	744.0	1500.0
Hosokawa **Product Collector**	1.6	744.0	1200.0
Mill 10 Current and Hosokawa Replacement 630	**Air to Cloth Ratio (CFM/ft2 = ft/min)**	**ft2 of Cloth**	**CFM**
Community Mill 10 **Product Collector**	3.4	440.0	1500.0
Hosokawa **Product Collector**	2.7	440.0	1200.0

Attachment 3
Jet Mill Filtration Efficiency Information

SHAMROCK
Particle Innovation • Surface Solutions

Shamrock Technologies, Inc.
301 Community Drive
Henderson, KY USA 42420
Tel: +1-270-826-7006
Fax: +1-270-826-7235
www.shamrocktechnologies.com

June 22, 2022

Re: **Jet Mill Filtration Efficiency Information**

Objective: To confirm lower flow thus lower velocity improves product collector efficiency with Shamrock's processes and products.

Shamrock uses bag houses to collect PTFE product from our mill process. The finished product size targets vary between a minimum of 2.6 to ~ 25um. Our filter design and hence bag filter selection is focused on collecting and retaining all product material. We utilize a pulse jet system to clean the bag filters.

Our bag selection is as follows:

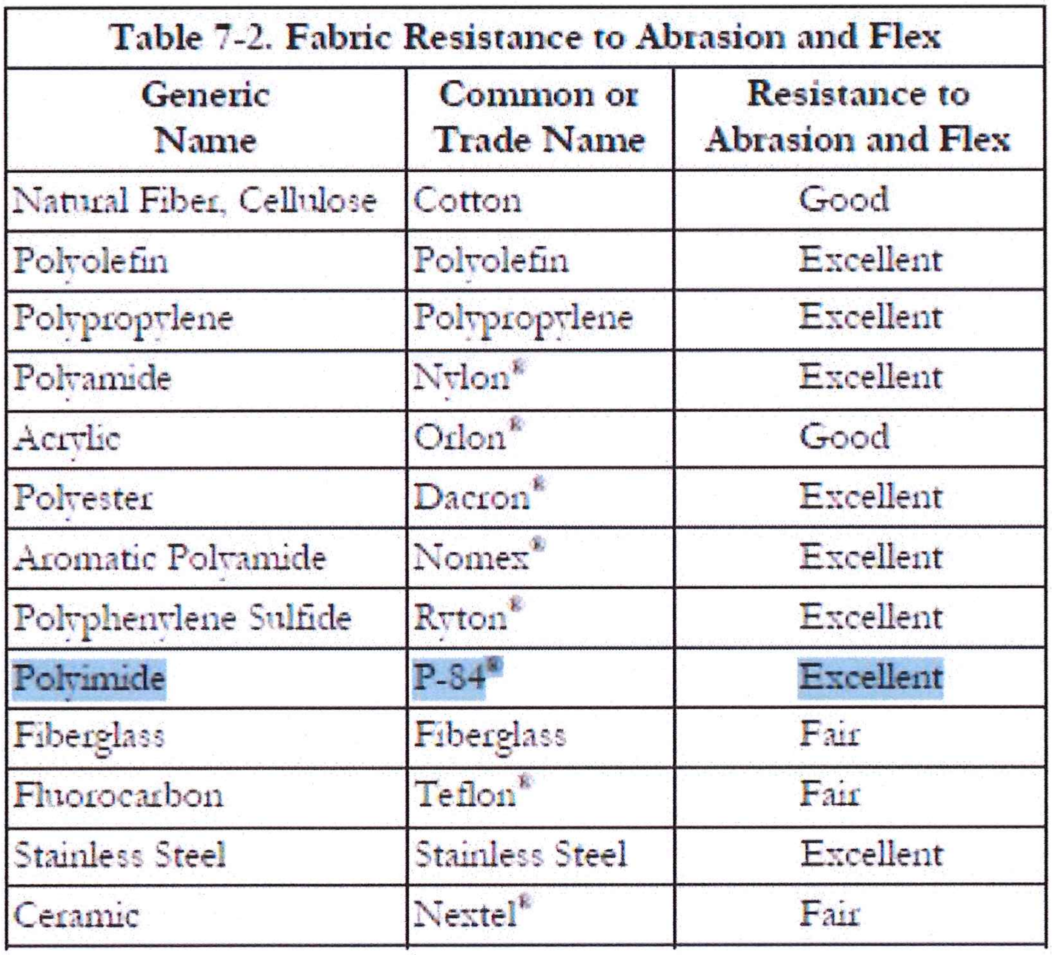

Table 7-2. Fabric Resistance to Abrasion and Flex

Generic Name	Common or Trade Name	Resistance to Abrasion and Flex
Natural Fiber, Cellulose	Cotton	Good
Polyolefin	Polyolefin	Excellent
Polypropylene	Polypropylene	Excellent
Polyamide	Nylon®	Excellent
Acrylic	Orlon®	Good
Polyester	Dacron®	Excellent
Aromatic Polyamide	Nomex®	Excellent
Polyphenylene Sulfide	Ryton®	Excellent
Polyimide	P-84®	Excellent
Fiberglass	Fiberglass	Fair
Fluorocarbon	Teflon®	Fair
Stainless Steel	Stainless Steel	Excellent
Ceramic	Nextel®	Fair

FILTER HOLDINGS

Specialists in High Performance Filters

20 Milltown Rd.
Union, NJ 07083
(908) 697-3500

SUMMIT FILTER S/924-60

Material Specifications for

16 oz. P84 with Teflon Finish

Fiber Content	:	100% Polyimide - Polyamid Proprietary Blend
Construction	:	Needle Punched Felt
Scrim	:	PTFE
Surface Finish	:	Fully Cured Multi-Layered Microcellular Teflon Coating
Nominal Weight	:	16 oz./sq. yard
Nominal Burst Strength	:	500 lbs/sq. inch Minimum
Nominal Air Permeability	:	25-35 CFM/sq. foot
Nominal Efficiency	:	99.99% for particles Greater than one micron
Temperature Limit	:	460°F Continuous

Shamrock has designed the product collector baghouses to operate at a LOW air/filter ratio to slow the velocity of the air through the bags giving the bag the ability to hold more dust cake while allowing the volume of air to pass through the filter which improves efficiency of the system. We are using premium, Teflon coated P-84 filters on all our systems.

The benefits of a low air/filter ratio are discussed in the U.S. EPA manual APTI 413: Control of Particulate Matter Emissions 5th Edition Student Manual, Chapter 7 (retrieved at https://documents.pub/document/smch-7-2.html).

See below for excerpts:

SHAMROCK
Particle Innovation · Surface Solutions

Shamrock Technologies, Inc.
301 Community Drive
Henderson, KY USA 42420
Tel: +1-270-826-7006
Fax: +1-270-826-7235
www.shamrocktechnologies.com

NACAA

ENVIRONMENTAL PROTECTION AGENCY

APTI 413: Control of Particulate Matter Emissions

(page 3)

As the air-to-cloth ratio increases, the localized gas velocities through the dust cake and fabric increase. At high air-to-cloth values, some particles, especially small particles, can gradually migrate through the dust layer and fabric. This is possible because dust particles within the cake are retained relatively weakly. After passing through the dust cake and fabric, these particles are re-entrained in the clean gas stream leaving the bag. Some of the factors that increase the tendencies for particle bleed-through include the following:
☐ Small particle size distribution
☐ Fabric flexing and movement
☐ Small dust cake quantities
Pore collapse in woven fabrics is also caused by high air-to-cloth ratios. At high air-tocloth ratios, the forces on the particle bridges that span the holes in the fabric weave can be too large. Once a bridge is shattered and pushed through the fabric, an uncovered hole is created. The gas stream channels through this low resistance path through the bag.

(page 3-4)

The net result of seepage and pore collapse is increased particulate matter emissions at high air-to-cloth ratios. The general nature of the relationship is shown in Figure 7-2.

APTI 413: CONTROL OF PARTICULATE MATTER EMISSIONS
CHAPTER 7

The effect is relatively minor until a threshold air-to-cloth ratio is reached. Above this value, emissions can increase rapidly. A baghouse that is severely undersized for the gas flow being treated (high air-to-cloth ratio) can have abnormally low removal efficiency.

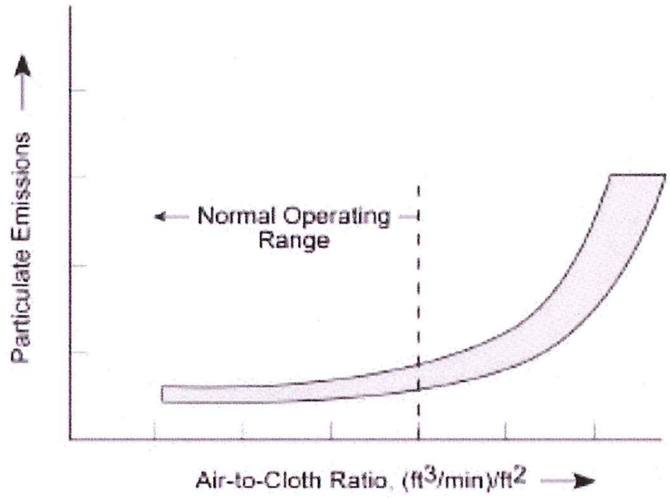

Figure 7-2. Emissions as a function of air-to-cloth ratio

Air-to-Cloth Ratio

The air-to-cloth ratio is the main sizing parameter used for fabric filters. Low values of the air-to-cloth ratio indicate that the velocity of gas passing through a given area of the fabric is relatively low. This favors proper particulate matter capture and moderate static pressure drops.

Air to filter (air to cloth) ratios for the current and replacement mill configurations are shown below. The air to cloth ratios will be lower in the new system, which is expected to retain the high particulate matter capture efficiency of the system.

SHAMROCK
Particle Innovation • Surface Solutions

Shamrock Technologies, Inc.
301 Community Drive
Henderson, KY USA 42420
Tel: +1-270-826-7006
Fax: +1-270-826-7235
www.shamrocktechnologies.com

Mill 2 Current and Hosokawa Replacement 710	**Air to Cloth Ratio (CFM/ft2 = ft/min)**	**ft2 of Cloth**	**CFM**
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Community Mill 2 **Product Collector**	1.9	980.2	1838.0
Hosokawa 710 Mill ***eliminates vent*** but keeps P**roduct Collector**	1.7	980.2	1643.0
Mill 8 Current and Hosokawa Replacement 630	**Air to Cloth Ratio (CFM/ft2 = ft/min)**	**ft2 of Cloth**	**CFM**
Community Mill 8 **Product Collector**	2.0	744.0	1500.0
Hosokawa **Product Collector**	1.6	744.0	1200.0
Mill 10 Current and Hosokawa Replacement 630	**Air to Cloth Ratio (CFM/ft2 = ft/min)**	**ft2 of Cloth**	**CFM**
Community Mill 10 **Product Collector**	3.4	440.0	1500.0
Hosokawa **Product Collector**	2.7	440.0	1200.0

Attachment 4
Particulate Emission Calculations

AECOM

Shamrock Technologies, Inc.
Community Drive

Mill 2, 8 ,10 Emissions Calculations

6/3/2022

Process	Em Unit ID	Emission Unit	Stack ID	Air Pollution Control Device	Maximum Throughputs[1]					Throughput Notes	Collector Type	PM / PM$_{10}$ Emissions					Emission Factor Basis
					Operating Parameter	Max Hours (hrs/yr)	Hourly Rate (units/hr)	Annual Rate (units/yr)	Process Rate Units			Outlet PM (grains / ascf)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	
Mill 2 (White Mill)	~~D5~~	~~Mill 2 (White Mill) Mill Vent - will not be present with replacement Hosokawa Mill~~	~~D5~~	~~None~~	~~Irradiated PTFE~~	~~8,760~~	~~0.500~~	~~4,380~~	~~thousand lbs~~		~~Summit Filter P84~~	~~NA~~	~~1.00E+00~~	~~0%~~	~~2.1900~~	~~2.1900~~	~~Filter removal efficiency per Summit Filter P84 specification sheet is 99.99% removal. Conservatively assumed 99.9% removal.~~
	D8	Mill 2 product collector baghouse	D-8	None	Irradiated PTFE	8,760	0.500	4,380	thousand lbs		Summit Filter P84	NA	1.00E+00	0%	2.1900	2.1900	Filter removal efficiency per Summit Filter P84 specification sheet is 99.99% removal. Conservatively assumed 99.9% removal.
Mill 8	C9	Mill 8 product collector baghouse	C-9	None	Irradiated PTFE	8,760	0.200	1,752	thousand lbs		Summit Filter P84	NA	1.00E+00	0%	0.8760	0.8760	Filter removal efficiency per Summit Filter P84 specification sheet is 99.99% removal. Conservatively assumed 99.9% removal.
Mill 10	C12	Mill 10 product collector baghouse	C-12	None	Irradiated PTFE	8,760	0.250	2,190	thousand lbs		Summit Filter P84	NA	1.00E+00	0%	1.0950	1.0950	Filter removal efficiency per Summit Filter P84 specification sheet is 99.99% removal. Conservatively assumed 99.9% removal.

1 Maximum annual throughput and associated emissions in some cases reflect inherent limitations on the supply of scrap PTFE

Attachment 5
DEP7007 Permit Application Forms

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007AI

Administrative Information

___ Section AI.1: Source Information
___ Section AI.2: Applicant Information
___ Section AI.3: Owner Information
___ Section AI.4: Type of Application
___ Section AI.5: Other Required Information
___ Section AI.6: Signature Block
___ Section AI.7: Notes, Comments, and Explanations

Additional Documentation

__ Additional Documentation attached

Source Name: Shamrock Technologies, Inc.
KY EIS (AFS) #: 21-101-00136
Permit #: F-16-012 R1
Agency Interest (AI) ID: 46709
Date:

Section AI.1: Source Information

Physical Location Address:
Street: 301 Community Drive
City: Henderson **County:** Henderson **Zip Code:** 42420

Mailing Address:
Street or P.O. Box: Same as above
City: **State:** **Zip Code:**

Standard Coordinates for Source Physical Location

Longitude: -87.641262 (decimal degrees) **Latitude:** 37.805884 (decimal degrees)

Primary (NAICS) Category: All other plastics products manufacturing **Primary NAICS #:** 326199

Classification (SIC) Category: Chemicals and Chemical Preparations NEC

Primary SIC #: 2899

Briefly discuss the type of business conducted at this site: Shamrock recycles polytetrafluoroethylene (PTFE) by irradiating the ground material and baking irradiated material to process into fresh micropowders for different applications within inks and coatings, etc.

Description of Area Surrounding Source: __ Rural Area __ Urban Area __ Industrial Park X Industrial Area __ Residential Area __ Commercial Area

Is any part of the source located on federal land? __ Yes X No

Number of Employees: 92 (approx)

Approximate distance to nearest residence or commercial property: 700 feet (approx)

Property Area: 11 acres (approx)

Is this source portable? __ Yes X No

What other environmental permits or registrations does this source currently hold or need to obtain in Kentucky?

NPDES/KPDES:	X Currently Hold	__ Need	__ N/A
Solid Waste:	__ Currently Hold	__ Need	X N/A
RCRA:	X Currently Hold	__ Need	__ N/A
UST:	__ Currently Hold	__ Need	X N/A

Type of Regulated Waste Activity:
__ Mixed Waste Generator X Generator __ Recycler __ Other: ______
__ U.S. Importer of Hazardous Waste __ Transporter __ Treatment/Storage/Disposal Facility __ N/A

Section AI.2: Applicant Information

Applicant Name: Shamrock Technologies, Inc.

Title: (if individual)

Mailing Address:
Street or P.O. Box: 301 Community Drive
City: Henderson **State:** KY **Zip Code:** 42420

Email: (if individual)

Phone: (270) 826-7006

Technical Contact

Name: Susan Haynes

Title: EHS Manager

Mailing Address:
Street or P.O. Box: 301 Community Drive
City: Henderson **State:** KY **Zip Code:** 42420

Email: shaynes@shamrocktechnologies.com

Phone: (270) 826-7006 EXT 2041

Air Permit Contact for Source

Name: Michael Jussila

Title: Global Manufacturing and Engineering Leader

Mailing Address:
Street or P.O. Box: 301 Community Drive
City: Henderson **State:** KY **Zip Code:** 42420

Email: mjussila@shamrocktechnologies.com

Phone: (270) 826-7006 EXT 2044

Section AI.3: Owner Information

__ Owner same as applicant

Name: William Neuberg

Title: President

Mailing Address:
Street or P.O. Box: Foot of Pacific Street
City: Newark **State:** NJ **Zip Code:** 07114

Email: bneuberg@shamrocktechnologies.com

Phone: (973) 286-4889

List names of owners and officers of the company who have an interest in the company of 5% or more.

Name	Position
William Neuberg	Owner and President

Section AI.4: Type of Application

Current Status: __ Title V X Conditional Major __ State-Origin __ General Permit __ Registration __ None

Requested Action:
(check all that apply)

__ Name Change
__ Renewal Permit
X 502(b)(10) Change
__ Revision
__ Ownership Change

__ Initial Registration
__ Revised Registration
__ Extension Request
__ Off Permit Change
__ Closure

__ Significant Revision
__ Minor Revision
__ Addition of New Facility
__ Landfill Alternate Compliance Submittal

__ Administrative Permit Amendment
__ Initial Source-wide OperatingPermit
__ Portable Plant Relocation Notice
__ Modification of Existing Facilities

Requested Status: __ Title V X Conditional Major __ State-Origin __ PSD __ NSR __ Other: ________

Is the source requesting a limitation of potential emissions? __ Yes X No no change requested to existing HAP limititations

Pollutant:	Requested Limit:	Pollutant:	Requested Limit:
__ Particulate Matter		__ Single HAP	
__ Volatile Organic Compounds (VOC)		__ Combined HAPs	
__ Carbon Monoxide		__ Air Toxics (40 CFR 68, Subpart F)	
__ Nitrogen Oxides		__ Carbon Dioxide	
__ Sulfur Dioxide		__ Greenhouse Gases (GHG)	
__ Lead		__ Other	

For New Construction:

Proposed Start Date of Construction: *(MM/YYYY)* 06/2022

Proposed Operation Start-Up Date: *(MM/YYYY)* 08/2022

For Modifications:

Proposed Start Date of Modification: *(MM/YYYY)* ________

Proposed Operation Start-Up Date: *(MM/YYYY)* ________

Applicant is seeking coverage under a permit shield. __ Yes __ No

Identify any non-applicable requirements for which permit shield is sought on a separate attachment to the application.

Section AI.5 Other Required Information

Indicate the documents attached as part of this application:

__ DEP7007A Indirect Heat Exchangers and Turbines
__ DEP7007B Manufacturing or Processing Operations
__ DEP7007C Incinerators and Waste Burners
__ DEP7007F Episode Standby Plan
__ DEP7007J Volatile Liquid Storage
__ DEP7007K Surface Coating or Printing Operations
__ DEP7007L Mineral Processes
__ DEP7007M Metal Cleaning Degreasers
__ DEP7007N Source Emissions Profile
__ DEP7007P Perchloroethylene Dry Cleaning Systems
__ DEP7007R Emission Offset Credit
__ DEP7007S Service Stations
__ DEP7007T Metal Plating and Surface Treatment Operations
__ DEP7007V Applicable Requirements and Compliance Activities
__ DEP7007Y Good Engineering Practice and Stack Height Determination
__ DEP7007AA Compliance Schedule for Non-complying Emission Units
__ DEP7007BB Certified Progress Report

__ DEP7007CC Compliance Certification
X DEP7007DD Insignificant Activities
__ DEP7007EE Internal Combustion Engines
__ DEP7007FF Secondary Aluminum Processing
__ DEP7007GG Control Equipment
__ DEP7007HH Haul Roads
__ Confidentiality Claim
__ Ownership Change Form
__ Secretary of State Certificate
__ Flowcharts or diagrams depicting process
__ Digital Line Graphs (DLG) files of buildings, roads, etc.
__ Site Map
__ Map or drawing depicting location of facility
__ Safety Data Sheet (SDS)
__ Emergency Response Plan
X Other: Emission calculations

Section AI.6: Signature Block

I, the undersigned, hereby certify under penalty of law, that I am a responsible official*, and that I have personally examined, and am familiar with, the information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the information is on knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false or incomplete information, including the possibility of fine or imprisonment.

Michael Jussila
Authorized Signature

June 22, 2022
Date

Michael Jussila
Type or Printed Name of Signatory

Global Manufacturing and Engineering Leader
Title of Signatory

*Responsible official as defined by 401 KAR 52:001.

Division for Air Quality
300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007DD

Insignificant Activities

___ Section DD.1: Table of Insignificant Activities
___ Section DD.2: Signature Block
___ Section DD.3: Notes, Comments, and Explanations

Source Name: Shamrock Technologies, Inc.
KY EIS (AFS) #: 21-101-00136
Permit #: F-16-012 R1
Agency Interest (AI) ID: 46709
Date:

Section DD.1: Table of Insignificant Activities

*Identify each activity with a unique Insignificant Activity number (IA #); for example: 1, 2, 3… etc.

Insignificant Activity #	Description of Activity including Rated Capacity	Serial Number or Other Unique Identifier	Applicable Regulation(s)	Calculated Emissions
~~10~~	~~Mill 2 Mill Vent~~ ~~500 lb/hr PTFE milled~~	~~D5~~	~~401 KAR 59:010~~	This vent is being eliminated for an emissions reduction of PM / PM10 / PM2.5: 0.50 lb/hr, 2.19 ton/yr
11	Hosakawa Mill 2 500 lb/hr PTFE milled	D8	401 KAR 59:010	No credit taken for any emissions reductions
26	Hosakawa Mill 8 200 lb/hr PTFE milled	C9	401 KAR 59:010	No credit taken for any emissions reductions
31	Hosakawa Mill 10 250 lb/hr PTFE milled	C12	401 KAR 59:010	No credit taken for any emissions reductions

Section DD.2: Signature Block

I, THE UNDERSIGNED, HEREBY CERTIFY UNDER PENALTY OF LAW, THAT I AM A RESPONSIBLE OFFICIAL, AND THAT I HAVE PERSONALLY EXAMINED, AND AM FAMILIAR WITH, THE INFORMATION SUBMITTED IN THIS DOCUMENT AND ALL ITS ATTACHMENTS. BASED ON MY INQUIRY OF THOSE INDIVIDUALS WITH PRIMARY RESPONSIBILITY FOR OBTAINING THE INFORMATION, I CERTIFY THAT THE INFORMATION IS ON KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE OR INCOMPLETE INFORMATION, INCLUDING THE POSSIBILITY OF FINE OR IMPRISONMENT.

By:

Michael Jussila
Authorized Signature

June 22, 2022
Date

Michael Jussila
Type/Print Name of Signatory

Global Manufacturing and Engineering Leader
Title of Signatory

Attachment 6
Interim Measures Proposal

SHAMROCK
Particle Innovation • Surface Solutions

Shamrock Technologies, Inc.
301 Community Drive
Henderson, KY USA 42420
Tel: +1-270-826-7006
Fax: +1-270-826-7235
www.shamrocktechnologies.com

June 22, 2022

via e-mail

Larry Hughes
Office of the Commissioner
Kentucky Department for Environmental Protection
300 Sower Boulevard
Frankfort, Kentucky 40601

Re: Shamrock Technologies, Inc.
Agreed Order DOW-19-2-069
AI Nos. 46709, 38464, 46707
Interim Measures Proposal—Mill Replacements at Community Drive

Dear Mr. Hughes,

Please find attached an Interim Measures Proposal in accordance with Agreed Order DOW-19-2-0069 for reduction of PFAS emissions in operations at the Shamrock Technologies, Inc. (Shamrock) Community Drive facility. Shamrock has modified this final submission according to requests received from the Kentucky Division for Air Quality. A Section 502(b)(10) change notification is being simultaneously submitted to the Kentucky Division for Air Quality. Per 401 KAR 52:030 Section 17(2)(b), Shamrock will proceed with these changes within 7 days of this notification unless we hear otherwise from you.

We appreciate the Division's direction in working through these difficult issues in moving forward with control measures to reduce PFAS air emissions as expeditiously as possible.

If you have any questions regarding this proposal, please do not hesitate to contact me.

Sincerely,

Michael Jussila

Michael Jussila
Global Manufacturing and Engineering Leader

cc: Tony Hatton, (KDEP)
Michael Kennedy (KDEP)
Rick Shewekah (KDAQ)
Craig Collins (Shamrock)

22095032.v2
22095032.v4

Shamrock Technologies, Inc.
Community Drive Facility
Agreed Order DOW-19-2-0069
Interim Measures Proposal for Mill Replacements
June 22, 2022

Shamrock Technologies, Inc. (Shamrock) voluntarily entered into Agreed Order DOW-19-2-0069 with the Energy and Environment Cabinet (the Cabinet) on November 1, 2019 for settlement of all alleged violations and deficiencies related to its voluntary disclosure of discovery of Per- and Poly- Flurol-Alkylated Substances (PFAS) found in soil and groundwater samples. Pursuant to the Agreed Order, Shamrock has engaged in on- and off-site characterization, including conducting an inventory of PFAS air emission sources.

On April 23, 2021, the Cabinet directed that continued off-site characterization should include an inventory of primary and secondary PFAS sources. The Cabinet approved Shamrock's Off-Site Characterization Work Plan Phase 2 on September 20, 2021. The field work for this characterization phase was completed in March, 2022 and an off-site characterization report for this phase, including the inventory, is scheduled to be provided to the Cabinet in June, 2022. Pursuant to the Cabinet's April 23, 2021, PFAS air emissions are to be addressed in the Conceptual Site Model and Corrective Action Plan.

Shamrock has diligently analyzed control measures and has identified a general approach for control of air emissions which it shared with the Cabinet on March 31, 2022. Included in the approach are certain control measures Shamrock is prepared to propose as Interim Measures under the Agreed Order. The first interim measure, mill replacements, is the subject of this Interim Measures Proposal[1].

Shamrock proposes to replace Mill 2 with a Hosokawa model 710 mill and to replaced mills 8 and 10 with Hosokawa model 630 mills for reduction of PFAS at the facility.

Background

Mills are utilized to break PTFE into particles to be processed for use by specific customers. The customer use dictates the size of particle to be processed. Mill 2 was installed in 1998; Mills 8 and 10 were installed in the early 2000's. Mill design has significantly evolved since that time. New Hosokawa mills are more precise in their ability to consistently and quickly produce particles greater than 1 micron in size. Mill baghouses have a design efficiency of 99.99% where the

---

[1] Because mills at the Community Drive facility are included in Permit F-16-012 for PM emissions subject to 401 KAR 59:010, Shamrock is simultaneously submitting a 502(b)(10) change to the Division for Air Quality. A copy of this Proposal is attached to the 502(b)(10) change notification. PFAS is neither a regulated pollutant or hazardous air pollutant under the CAA at this time and is not covered under Permit F-16-012 R1. Consequently, air emission control interim measures are being submitted to the Cabinet pursuant to the Agreed Order. At such time as PFAS may become regulated or hazardous air pollutants under the CAA, Shamrock anticipates working with the Cabinet for changes to this approach, if any, that may be required.

particle size is greater than one micron.[2] This helps in reducing particulate matter (PM) emissions which in turn helps reduce PFAS emissions. For purposes of PFAS reduction, the new Hosokawa Mill 2 will only have one vent as opposed to two vents on current Mill 2. The removal of one air vent provides a quantifiable reduction in PFAS emissions. Based on engineering judgement the Hosokawa mills are also expected to result in reduced PFAS emissions from the vents that will remain on replacement Mills 2, 8 and 10. However, to be conservative, Shamrock proposes to only take credit for the quantifiable PFAS reductions provided by the removal of one vent on Mill 2.

PFAS Reductions

As previously stated, Shamrock is replacing existing Mills 2, 8 and 10 with Hosokawa Mills that use newer and more efficient milling technology. The maximum permitted capacity (pounds milled per hour) of the replacement mills will be the same as the existing mills.

Existing Mill 2 has two vents, a mill vent and a product collector vent. Each vent is controlled by a separate baghouse. Existing Mill 2 is the third largest source of PFAS emissions at the Community Drive facility, with total PFAS emissions of 8.69 lb/yr from both vents. The replacement Hosokawa mill for Mill 2 will have only one vent, the product collector vent. This will eliminate one emission point (D-5, Mill 2 Mill Vent) and the associated 6.35 lb/yr of total PFAS emissions. Existing Mills 8 and 10 have only a product collector vent each (no separate mill vent) and will be replaced with Hosokawa mills with one product collector vent each.

PFAS emitted by the mills is in the particulate phase. Significant vapor phase PFAS is not expected because the material is not being heated or irradiated. Therefore, PFAS emissions changes are expected to directionally reflect particulate emissions changes.

In addition to eliminating the Mill 2 Mill vent, the replacement mill project is expected to achieve additional PFAS emission reductions due to the improved milling technology used by the new Hosokawa mills. These additional expected emission reductions are due to:

- Less milling air used (i.e., the same amount of material will be milled using significant less milling air)
- The lower milling air rates will result in lower exhaust flow rates and therefore lower air to cloth ratios, which are expected to improve the baghouse particulate removal efficiency. Because PFAS is a particulate, this will reduce PFAS emissions.
- The Hosakawa mills produce more accurately sized materials with a particle size distribution much closer to the target diameters, with fewer of the smaller (less than 1 micron) particles that are not desired in the Shamrock products. Because the replacement mills will produce

---

[2] The baghouses operate within the manufacturer specified parameter. The only parameter that the bag filter manufacturer provides is nominal air permeability (cfm/ft2). Attachment 2 to the Section 502(b)(10) submittal provides the filter manufacturer specification sheet and a calculation of the air to filter ratio (cfm/ft2) demonstrating that it does not exceed the manufacture specification.

fewer particles less than 1 micron, a higher percentage of particles is expected to be captured by the baghouses.

It is difficult to precisely quantify the emissions reduction achieved by the above factors so this application does not take credit for any emissions reductions other than from the elimination of the Mill 2 Mill Vent (Emission Point D-5). However, based on engineering judgement Shamrock believes that there will be PFAS emissions reductions from the remaining vents.

Detailed emission calculations are provided in Attachment 1 to this proposal. Table 1 below, and Attachment 1, provides a summary of the estimated PFAS emission reductions. Table 2 shows the 2019 stack test emission factor for Mill 2 Mill vent that is being removed. These factors were in turn used to estimate hourly potential emissions (Table 3) at the hourly permitted mill capacity, actual annual emissions (Table 4) at actual annual production rates used for the 2019 PFAS study, and potential emission rates (Table 5) at continuous operation.

The following table summarizes the PFAS emissions change.

Known Emission Reductions									
	Hourly Emissions (lb/hr total PFAS)			**Annual Actual Emissions (lb/yr total PFAS)**			**Annual PTE Emissions (lb/yr total PFAS)**		
	Existing	**Replace -ment**	**Change**	**Existing**	**Replace -ment**	**Change**	**Existing**	**Replace -ment**	**Change**
Mill 2 Mill Vent[1]	1.83E-03	0	**-1.83E-03**	6.35	0	**-6.35**	16.06	0	**-16.06**
1 Replacement Mill 2 will have only one emission point. Mill vent on existing Mill 2 will not exist in new configuration.									

Implementation of this Interim Measure

As stated during our March 31, 2022 meeting, Shamrock proposes to begin installation of the new mills in the third quarter of this year. Our current expectation is to replace Mill 2 by August, 2022 and to replace Mills 8 and 10 by the end of the year. Shamrock reserve the ability to extend those time frames on the basis of supply chain issues if necessary. Otherwise, Shamrock, like KDEP, is anxious to install preventative measures as quickly as is feasible.

Attachment 1

PFAS Emission Calculations

Table 1. PFAS Emissions Change Summary

Known Emission Reductions

	Hourly Emissions (lb/hr total PFAS)			Annual Actual Emissions (lb/yr total PFAS)			Annual PTE Emissions (lb/yr total PFAS)		
	Existing	**Replace-ment**	**Change**	**Existing**	**Replace-ment**	**Change**	**Existing**	**Replace-ment**	**Change**
Mill 2 Mill Vent[1]	1.83E-03	0	**-1.83E-03**	6.35	0	**-6.35**	16.06	0	**-16.06**

1 Replacement Mill 2 will have only one emission point. Mill vent on existing Mill 2 will not exist in new configuration.

Table 2. PFAS Emission Factors for Existing Mills 2 Mill Vent

	Existing Mill 2 Mill Vent Baghouse Outlet
Stack ID	D-5
Emission Unit Description	Mill 2 Mill Vent Baghouse
Baked or Unbaked	Unbaked
PFAS Chemical (g/lb milled)[1]	g/lb milled
Perfluorobutanoic acid (PFBA)	6.52E-04
Perfluoropentanoic acid (PFPeA)	3.26E-04
Perfluorohexanoic acid (PFHxA)	1.96E-04
Perfluoroheptanoic acid (PFHpA)	1.75E-04
Perfluorooctanoic acid (PFOA)	1.27E-04
Perfluorononanoic acid (PFNA)	9.84E-05
Perfluorodecanoic acid (PFDA)	4.86E-05
Perfluoroundecanoic acid (PFUnA)	2.25E-05
Perfluorotridecanoic acid (PFTriA)	3.83E-06
Perfluorotetradecanoic acid (PFTeA)	3.97E-06
Perfluorododecanoic acid (PFDoA)	6.60E-06
HFPO-DA (GenX)	1.49E-06
Perfluorobutanesulfonic acid (PFBS)	0
Perfluorohexanesulfonic acid (PFHxS)	0
Perfluorooctanesulfonic acid (PFOS)	0
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0
4:2 FTS	0
6:2 FTS	7.61E-07

1 Existing emission factors from Shamrock Annual PFAS Air Emissions Summary, August 26, 2019

Table 3. PFAS Hourly PTE for Existing Mill 2 Mill Vent

	Existing Mill 2 Mill Vent Baghouse Outlet
Stack ID	D-5
Emission Unit Description	Mill 2 Mill Vent Baghouse
Baked or Unbaked	Unbaked
Mill Permitted Capacity (lb/hr)	500
	Emissions (lb/hr)
PFAS Chemical	
Perfluorobutanoic acid (PFBA)	7.19E-04
Perfluoropentanoic acid (PFPeA)	3.59E-04
Perfluorohexanoic acid (PFHxA)	2.16E-04
Perfluoroheptanoic acid (PFHpA)	1.93E-04
Perfluorooctanoic acid (PFOA)	1.40E-04
Perfluorononanoic acid (PFNA)	1.08E-04
Perfluorodecanoic acid (PFDA)	5.36E-05
Perfluoroundecanoic acid (PFUnA)	2.48E-05
Perfluorotridecanoic acid (PFTriA)	4.22E-06
Perfluorotetradecanoic acid (PFTeA)	4.37E-06
Perfluorododecanoic acid (PFDoA)	7.28E-06
HFPO-DA (GenX)	1.65E-06
Perfluorobutanesulfonic acid (PFBS)	0
Perfluorohexanesulfonic acid (PFHxS)	0
Perfluorooctanesulfonic acid (PFOS)	0.00E+00
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0
4:2 FTS	0
6:2 FTS	8.39E-07
Total PFAS	1.83E-03

Replacement Mill 2 will have only one emission point. Mill vent on existing Mill 2 will not exist in new configuration.
Emissions (lb/hr) = Permitted mill capacity (lb/hr) x PFAS emission factor (g/lb) / 453.59237 g/lb. PFAS emission factors from Table 2.

Table 4. PFAS Annual Actual for Existing Mill 2 Mill Vent

	Existing Mill 2 Mill Vent Baghouse Outlet
Stack ID	D-5
Emission Unit Description	Mill 2 Mill Vent Baghouse
Baked or Unbaked	Unbaked
Actual Annual (lb/yr)^2	1,732,000
	Emissions (lb/yr)
PFAS Chemical	
Perfluorobutanoic acid (PFBA)	2.49E+00
Perfluoropentanoic acid (PFPeA)	1.25E+00
Perfluorohexanoic acid (PFHxA)	7.49E-01
Perfluoroheptanoic acid (PFHpA)	6.69E-01
Perfluorooctanoic acid (PFOA)	4.86E-01
Perfluorononanoic acid (PFNA)	3.76E-01
Perfluorodecanoic acid (PFDA)	1.86E-01
Perfluoroundecanoic acid (PFUnA)	8.60E-02
Perfluorotridecanoic acid (PFTriA)	1.46E-02
Perfluorotetradecanoic acid (PFTeA)	1.51E-02
Perfluorododecanoic acid (PFDoA)	2.52E-02
HFPO-DA (GenX)	5.71E-03
Perfluorobutanesulfonic acid (PFBS)	0.00E+00
Perfluorohexanesulfonic acid (PFHxS)	0.00E+00
Perfluorooctanesulfonic acid (PFOS)	0.00E+00
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0.00E+00
4:2 FTS	0.00E+00
6:2 FTS	2.91E-03
Total PFAS	6.35E+00

1 Annual rate from August 26, 2019 Annual PFAS Air Emissions Summary report submitted to KDEP

Replacement Mill 2 will have only one emission point. Mill vent on existing Mill 2 will not exist in new configuration.

Emissions (lb/yr) = Annual mill rate (lb/yr) x PFAS emission factor (g/lb) / 453.59237 g/lb. PFAS emission factors from Table 2.

Table 5. PFAS Annual PTE for Existing Mill 2 Mill Vent

	Existing Mill 2 Mill Vent Baghouse Outlet
Stack ID	D-5
Emission Unit Description	Mill 2 Mill Vent Baghouse
Baked or Unbaked	Unbaked
Mill Permitted Capacity (lb/hr)	500
Potential Operating Hours (hr/yr)	8760
Potential Annual Capacity (lb/yr)	4,380,000
	Emissions (lb/yr)
PFAS Chemical	
Perfluorobutanoic acid (PFBA)	6.30E+00
Perfluoropentanoic acid (PFPeA)	3.15E+00
Perfluorohexanoic acid (PFHxA)	1.89E+00
Perfluoroheptanoic acid (PFHpA)	1.69E+00
Perfluorooctanoic acid (PFOA)	1.23E+00
Perfluorononanoic acid (PFNA)	9.50E-01
Perfluorodecanoic acid (PFDA)	4.70E-01
Perfluoroundecanoic acid (PFUnA)	2.18E-01
Perfluorotridecanoic acid (PFTriA)	3.70E-02
Perfluorotetradecanoic acid (PFTeA)	3.83E-02
Perfluorododecanoic acid (PFDoA)	6.38E-02
HFPO-DA (GenX)	1.44E-02
Perfluorobutanesulfonic acid (PFBS)	0.00E+00
Perfluorohexanesulfonic acid (PFHxS)	0.00E+00
Perfluorooctanesulfonic acid (PFOS)	0.00E+00
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0.00E+00
4:2 FTS	0.00E+00
6:2 FTS	7.35E-03
Total PFAS	1.61E+01

Replacement Mill 2 will have only one emission point. Mill vent on existing Mill 2 will not exist in new configuration.

Emissions (lb/yr) = Annual mill rate (lb/yr) x PFAS emission factor (g/lb) / 453.59237 g/lb. PFAS emission factors from Table 2.

Attachment 2

Section 502(b)(10) Change Notification

SHAMROCK
Particle Innovation • Surface Solutions

Shamrock Technologies, Inc.
301 Community Drive
Henderson, KY USA 42420
Tel: +1-270-826-7006
Fax: +1-270-826-7235
www.shamrocktechnologies.com

June 22, 2022

via e-mail and KDAQ portal submittal

Michael Kennedy, Director
Kentucky Division for Air Quality
300 Sower Boulevard
Frankfort, Kentucky 40601

Re: Shamrock Technologies, Inc.
Permit No. F-16-012 R1
AI No. 46709
502(b)(10) Change Notification, Mills 2, 8 and 10

Dear Mr. Kennedy,

Please find attached a Section 502(b)(10) for the above referenced permit submitted pursuant to 401 KAR 52:030 Section 17(2)(b). Per our discussions, this change notification is being submitted simultaneously with an Interim Measures Proposal in accordance with Agreed Order DOW-19-2-009 for reduction of PFAS emissions in operations at the Shamrock Technologies, Inc. (Shamrock) Community Drive facility. A copy of the Interim Measures Proposal is included.

We appreciate the Division's direction in working through these difficult issues in moving forward with control measures to reduce PFAS air emissions as expeditiously as possible.

We have edited the previously submitted draft submittal per your request, and are planning on moving forward with the change within 7 business days of this submittal unless we hear otherwise from the Division. If you have any questions regarding this 502(b)(10) change package, please do not hesitate to contact me.

Sincerely,

Michael Jussila

Michael Jussila
Global Manufacturing and Engineering Leader

cc: Tony Hatton (KDEP)
Larry Hughes (KDEP)
Rick Shewekah (KDAQ)
Craig Collins (Shamrock)

Attachment 1 – 502(b)(10) Change Description
Attachment 2 – Bag Filter Specification and Evaluation
Attachment 3 – Jet Mill Filtration Efficiency Information
Attachment 4 – Particulate Emission Calculations
Attachment 5 – DEP7007 Permit Application Forms
Attachment 6 – Interim Measures Proposal

Attachment 1
Section 502(b)(10) Change Description

Shamrock Technologies, Inc.
Community Drive Facility
Permit No. F-16-012 R1
502(b)(10) Change Notification
June 22, 2022

Shamrock Technologies, Inc. (Shamrock) voluntarily entered into Agreed Order DOW-19-2-0069 with the Energy and Environment Cabinet (the Cabinet) on November 1, 2019 for settlement of all alleged violations and deficiencies related to its voluntary disclosure of discovery of Per- and Poly- Flurol-Alkylated Substances (PFAS) found in soil and groundwater samples. Pursuant to the Agreed Order, Shamrock has engaged in on- and off-site characterization, including conducting an inventory of PFAS air emission sources. Shamrock has agreed to conduct certain interim measures to control air emissions at the Community Drive facility, including replacement of select existing mills with more efficient mills to reduce PFAS emissions.

Mills at Community Drive are listed Insignificant Activities in Permit F-16-012 subject to 410 KAR 59:010. Particulate Matter (PM) is the regulated pollutant emitted by mills under the Clean Air Act (CAA). PFAS is neither a regulated pollutant or hazardous air pollutant under the CAA at this time.

Shamrock is submitting this 502(b)(10) change notification to the Division for Air Quality (the Division) pursuant to 401 KAR 52:030 Section 17(2)(b) regarding impacts on PM emissions. Simultaneously, Shamrock is submitting to the Department of Environmental Protection (the Department) a Draft Interim Measure Proposal for replacement of the select mills pursuant to the Agreed Order for reduction of PFAS emissions. A copy of the Interim Measure Proposal is provided at Attachment 6.

This change is not a modification under Title I of the CAA and emissions will not exceed any emissions allowed under the permit. 401 KAR 52:30 Section 17(2)(a). This notification is being submitted at least seven work days in advance of the change.

Brief description of each change:

Mill 2 will be replaced with a Hosokawa model 710 mill. Mills 8 and 10 will be replaced with Hosokawa model 630 mills.

Mills are utilized to break PTFE into particles to be processed for use by specific customers. The customer use dictates the size of particle to be processed. Mill 2 was installed in 1998; Mills 8 and 10 were installed in the early 2000's. Mill design has significantly evolved since that time. New Hosokawa mills are more precise in their ability to consistently and quickly produce particles at the desired size. Desired sizes are usually greater than 1 micron. The old mills were not concise and produced particles at varying sizes, including more particles less than 1 micron. Also, the existing mill design results in particles remaining in the mills (resonance time) longer which can result in particle size that is smaller than desired, specifically less than 1 micron. The new Hosokawa mills reduce resonance time and thus reduce the number of particles less than 1 micron.

Date on which the change will occur:

Mill 2: August 2022 startup
Mill 8: January 2023 startup
Mill 10: December 2022 startup

These dates are subject to delays in supply and equipment receipt.

Any change in emissions that will occur:

As stated above, Shamrock is replacing existing Mills 2, 8 and 10 with Hosakawa Mills that use newer and more efficient milling technology. The maximum permitted capacity (pounds milled per hour) of the replacement mills will be the same as the existing mills.

Existing Mill 2 has two vents, a mill vent and a product collector vent. Each of these vents is equipped with a baghouse. These baghouses are used to separate product from conveying air and are necessary for product recovery. Therefore, the baghouses are product collection devices and not air pollution control devices. Therefore, emissions from the baghouse vents represent uncontrolled, controlled and potential emissions (because there is no air pollution control device).

The replacement Hosakawa mill for Mill 2 will have only one vent, the product collector vent. This will eliminate one emission point (D-5, Mill 2 Mill Vent) and the associated 2.19 ton/yr of potential particulate emissions from the baghouse vent.

Existing Mills 8 and 10 have only a product collector vent each (no separate mill vent) and will be replaced with Hosakawa mills with a product collector vent each. The product collector vents on these mills are equipped with baghouses. These baghouses are used to separate product from conveying air and are necessary for product recovery. Therefore, the baghouses are product collection devices and not air pollution control devices. Therefore, emissions from the baghouse vents represent uncontrolled, controlled and potential emissions (because there is no air pollution control device).

Air pollution control device is defined at 401 KAR 52:001 Section 1(11) as

> "Air pollution control equipment" means a mechanism, device, or contrivance used to control or prevent air pollution, that is not, aside from air pollution control laws and administrative regulations, vital to production of the normal product of the source or to its normal operation.

The baghouses are vital to the normal operation of this source. The baghouses are the sole product recovery device for the milling process, and without the baghouses the product could not be separated from the conveying air. Without the baghouses, Shamrock would not be able to produce any product since all material would be lost out the vents. Further guidance on air pollution control devices versus process equipment can be found in the Compliance Assurance Monitoring regulation, 40 CFR Part 64. The definition of "control device" at 40 CFR 64.1 excludes "inherent process equipment". Inherent process equipment is defined at 40 CFR 64.1 as "equipment that is necessary for the proper or safe functioning of the process, or material recovery equipment that the owner or operator documents is installed and operated primarily for purposes other than compliance with air pollution regulations.... For the purpose of this part, inherent process equipment is not considered a control device."

The baghouses are inherent process equipment because they are material recovery equipment that is installed and operated to recover product. Without the baghouses no product would be recovered.

The existing mills baghouses currently use Summit Filter P84 bags, with a manufacturer specified nominal efficiency of 99.99% particulate removal for particles greater than 1 micron. The replacement mills will use the same baghouses and identical filter bags. Emissions from the existing mills were estimated by multiplying the milling rate (pounds milled) by the product collector baghouse filter removal efficiency (1 – 99.9%) to estimate particulate emissions. [1] Note that although the manufacturer rating for the bags is 99.99% removal, Shamrock is conservatively using only 99.9% removal in the potential emission calculations (resulting in a PTE which is conservatively 10 times greater than would be estimated using the 99.99% rating).[2]

In addition to eliminating the Mill 2 Mill vent, the replacement mill project is expected to achieve additional emission reductions due to the improved milling technology used by the new Hosakawa mills. These additional expected emission reductions are due to:

- Less milling air used (i.e., the same amount of material will be milled using significant less milling air)
- The lower milling air rates will result in lower exhaust flow rates and therefore lower air to cloth ratios, which are expected to improve the baghouse removal efficiency
- The Hosokawa mills produce more accurately sized materials with a particle size distribution much closer to the target diameters, with fewer of the smaller (less than 1 micron) particles that are not desired in the Shamrock products. Because the replacement mills will produce fewer particles less than 1 micron, a higher percentage of particles is expected to be captured by the filters.

It is difficult to precisely quantify the emissions reduction achieved by these above factors so this application does not take credit for any emissions reductions other than from the elimination of the Mill 2 Mill Vent (Emission Point D-5). However, based on engineering judgement Shamrock believes that there will be particulate emissions reductions from the remaining vents..

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[1] Historically, mill particulate emissions were estimated using a filter grain loading and blower air flow rating. These historic estimates were used to demonstrate that each mill qualifies as an Insignificant Activity and were not updated when the existing filters were replaced with more efficient P84 bags, since the bag change led to reduced emissions. Filter grain loading is not provided by the manufacturer for the P84 bags. Instead, the manufacturer provides a removal efficiency rating. Therefore, the particulate emission calculation basis for this application for Mills 2, 8 and 10 is being revised to use the bag particulate removal efficiency.

[2] The baghouses operate within the manufacturer specified parameter. The only parameter that the bag filter manufacturer provides is nominal air permeability (cfm/ft2). Attachment 2 provides the filter manufacturer specification sheet and a calculation of the air to filter ratio (cfm/ft2) demonstrating that it does not exceed the manufacture specification. Attachment 3 further responds to questions raised by KDAQ regarding the efficiency of the product collector at lower flow velocity.

Particulate Emissions Change

Known Emission Reductions

Emission Point	Description	Current PTE		PTE after Replacement with Hosakawa Mills		PTE Change
		Lb/hr	Ton/yr	Lb/hr	Ton/yr	Ton/yr
D-5	Mill 2 Mill Vent[1]	0.50	2.19	No mill vent		**-2.19**

1. Replacement Mill 2 will only have one emission point. Mill vent will not exist in new configuration.

Detailed emission calculations are provided at Attachment 4.

<u>Any permit term or condition that will no longer be applicable after the change:</u>

No permit term or condition will no longer be applicable after the change.

Forms 7007 AI and DD are provided at Attachment 5.

Attachment 2
Bag Filter Specification and Evaluation

Bag Filter Specification

FILTER HOLDINGS
Specialists in High Performance Filters
20 Milltown Rd.
Union, NJ 07083
(908) 697-3500

SUMMIT FILTER S/924-60

Material Specifications for

16 oz. P84 with Teflon Finish

Fiber Content : 100% Polyimide – Polyamid Proprietary Blend

Construction : Needle Punched Felt

Scrim : PTFE

Surface Finish : Fully Cured Multi-Layered Microcellular Teflon Coating

Nominal Weight : 16 oz./sq. yard

Nominal Burst Strength : 500 lbs/sq. inch Minimum

Nominal Air Permeability: 25-35 CFM/sq. foot

Nominal Efficiency : 99.99% for particles Greater than one micron

Temperature Limit : 460°F Continuous

Actual Air to Cloth Ratios

Air to cloth ratios for current are replacement mills are less than the maximum permeability of the filter material.

Mill 2 Current and Hosokawa Replacement 710	**Air to Cloth Ratio (CFM/ft2 = ft/min)**	**ft2 of Cloth**	**CFM**
Community Mill 2 **Vent**	3.6	1395.4	4958.0
Community Mill 2 **Product Collector**	1.9	980.2	1838.0
Hosokawa 710 Mill ***eliminates vent*** but keeps P**roduct Collector**	1.7	980.2	1643.0
Mill 8 Current and Hosokawa Replacement 630	**Air to Cloth Ratio (CFM/ft2 = ft/min)**	**ft2 of Cloth**	**CFM**
Community Mill 8 **Product Collector**	2.0	744.0	1500.0
Hosokawa **Product Collector**	1.6	744.0	1200.0
Mill 10 Current and Hosokawa Replacement 630	**Air to Cloth Ratio (CFM/ft2 = ft/min)**	**ft2 of Cloth**	**CFM**
Community Mill 10 **Product Collector**	3.4	440.0	1500.0
Hosokawa **Product Collector**	2.7	440.0	1200.0

Attachment 3
Jet Mill Filtration Efficiency Information

SHAMROCK
Particle Innovation • Surface Solutions

Shamrock Technologies, Inc.
301 Community Drive
Henderson, KY USA 42420
Tel: +1-270-826-7006
Fax: +1-270-826-7235
www.shamrocktechnologies.com

June 22, 2022

Re: **Jet Mill Filtration Efficiency Information**

Objective: To confirm lower flow thus lower velocity improves product collector efficiency with Shamrock's processes and products.

Shamrock uses bag houses to collect PTFE product from our mill process. The finished product size targets vary between a minimum of 2.6 to ~ 25um. Our filter design and hence bag filter selection is focused on collecting and retaining all product material. We utilize a pulse jet system to clean the bag filters.

Our bag selection is as follows:

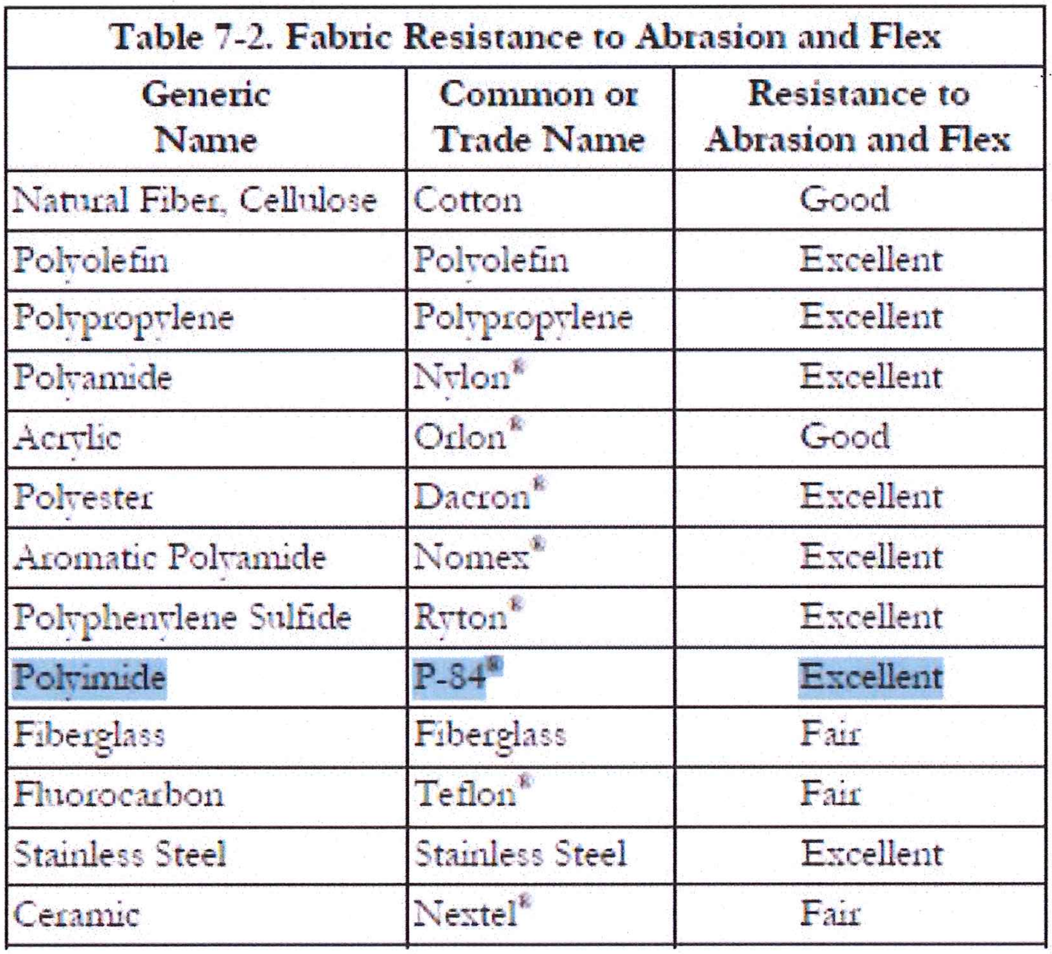

Table 7-2. Fabric Resistance to Abrasion and Flex

Generic Name	Common or Trade Name	Resistance to Abrasion and Flex
Natural Fiber, Cellulose	Cotton	Good
Polyolefin	Polyolefin	Excellent
Polypropylene	Polypropylene	Excellent
Polyamide	Nylon®	Excellent
Acrylic	Orlon®	Good
Polyester	Dacron®	Excellent
Aromatic Polyamide	Nomex®	Excellent
Polyphenylene Sulfide	Ryton®	Excellent
Polyimide	P-84®	Excellent
Fiberglass	Fiberglass	Fair
Fluorocarbon	Teflon®	Fair
Stainless Steel	Stainless Steel	Excellent
Ceramic	Nextel®	Fair

FILTER HOLDINGS
Specialists in High Performance Filters
20 Milltown Rd.
Union, NJ 07083
(908) 697-3500

SUMMIT FILTER S/924-60

Material Specifications for

16 oz. P84 with Teflon Finish

Fiber Content : 100% Polyimide - Polyamid Proprietary Blend

Construction : Needle Punched Felt

Scrim : PTFE

Surface Finish : Fully Cured Multi-Layered Microcellular Teflon Coating

Nominal Weight : 16 oz./sq. yard

Nominal Burst Strength : 500 lbs/sq. inch Minimum

Nominal Air Permeability: 25-35 CFM/sq. foot

Nominal Efficiency : 99.99% for particles Greater than one micron

Temperature Limit : 460°F Continuous

Shamrock has designed the product collector baghouses to operate at a LOW air/filter ratio to slow the velocity of the air through the bags giving the bag the ability to hold more dust cake while allowing the volume of air to pass through the filter which improves efficiency of the system. We are using premium, Teflon coated P-84 filters on all our systems.

The benefits of a low air/filter ratio are discussed in the U.S. EPA manual APTI 413: Control of Particulate Matter Emissions 5th Edition Student Manual, Chapter 7 (retrieved at https://documents.pub/document/smch-7-2.html).

See below for excerpts:

SHAMROCK
Particle Innovation • Surface Solutions

Shamrock Technologies, Inc.
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Henderson, KY USA 42420
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Fax: +1-270-826-7235
www.shamrocktechnologies.com

ENVIRONMENTAL PROTECTION AGENCY

APTI 413: Control of Particulate Matter Emissions

(page 3)

As the air-to-cloth ratio increases, the localized gas velocities through the dust cake and fabric increase. At high air-to-cloth values, some particles, especially small particles, can gradually migrate through the dust layer and fabric. This is possible because dust particles within the cake are retained relatively weakly. After passing through the dust cake and fabric, these particles are re-entrained in the clean gas stream leaving the bag. Some of the factors that increase the tendencies for particle bleed-through include the following:

☐ Small particle size distribution
☐ Fabric flexing and movement
☐ Small dust cake quantities

Pore collapse in woven fabrics is also caused by high air-to-cloth ratios. At high air-tocloth ratios, the forces on the particle bridges that span the holes in the fabric weave can be too large. Once a bridge is shattered and pushed through the fabric, an uncovered hole is created. The gas stream channels through this low resistance path through the bag.

(page 3-4)

The net result of seepage and pore collapse is increased particulate matter emissions at high air-to-cloth ratios. The general nature of the relationship is shown in Figure 7-2.

APTI 413: CONTROL OF PARTICULATE MATTER EMISSIONS
CHAPTER 7

The effect is relatively minor until a threshold air-to-cloth ratio is reached. Above this value, emissions can increase rapidly. A baghouse that is severely undersized for the gas flow being treated (high air-to-cloth ratio) can have abnormally low removal efficiency.

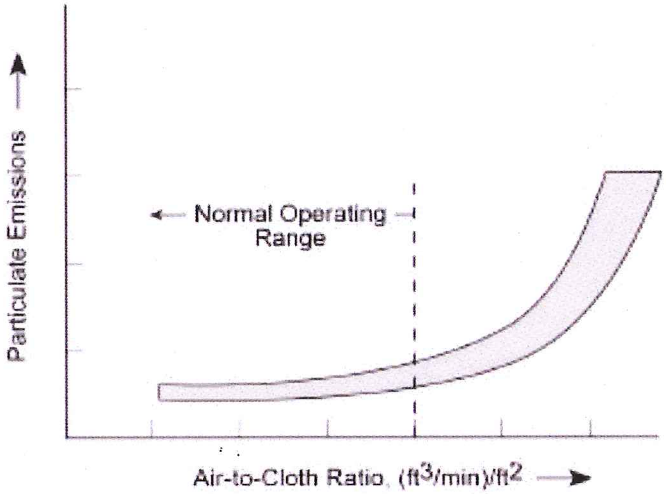

Figure 7-2. Emissions as a function of air-to-cloth ratio

Air-to-Cloth Ratio

The air-to-cloth ratio is the main sizing parameter used for fabric filters. Low values of the air-to-cloth ratio indicate that the velocity of gas passing through a given area of the fabric is relatively low. This favors proper particulate matter capture and moderate static pressure drops.

Air to filter (air to cloth) ratios for the current and replacement mill configurations are shown below. The air to cloth ratios will be lower in the new system, which is expected to retain the high particulate matter capture efficiency of the system.

SHAMROCK
Particle Innovation • Surface Solutions

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www.shamrocktechnologies.com

Mill 2 Current and Hosokawa Replacement 710	**Air to Cloth Ratio (CFM/ft2 = ft/min)**	**ft2 of Cloth**	**CFM**
Community Mill 2 **Vent**	3.6	1395.4	4958.0
Community Mill 2 **Product Collector**	1.9	980.2	1838.0
Hosokawa 710 Mill ***eliminates vent*** but keeps P**roduct Collector**	1.7	980.2	1643.0
Mill 8 Current and Hosokawa Replacement 630	**Air to Cloth Ratio (CFM/ft2 = ft/min)**	**ft2 of Cloth**	**CFM**
Community Mill 8 **Product Collector**	2.0	744.0	1500.0
Hosokawa **Product Collector**	1.6	744.0	1200.0
Mill 10 Current and Hosokawa Replacement 630	**Air to Cloth Ratio (CFM/ft2 = ft/min)**	**ft2 of Cloth**	**CFM**
Community Mill 10 **Product Collector**	3.4	440.0	1500.0
Hosokawa **Product Collector**	2.7	440.0	1200.0

Attachment 4
Particulate Emission Calculations

AECOM

Shamrock Technologies, Inc.
Community Drive

Mill 2, 8 ,10 Emissions Calculations

6/3/2022

Process	Em Unit ID	Emission Unit	Stack ID	Air Pollution Control Device	Maximum Throughputs[1]					Throughput Notes	Collector Type	PM / PM_{10} Emissions					Emission Factor Basis
					Operating Parameter	Max Hours (hrs/yr)	Hourly Rate (units/hr)	Annual Rate (units/yr)	Process Rate Units			Outlet PM (grains / ascf)	Emiss Factor (lb / process rate units)	Control Efficiency (%)	Uncontrolled Emiss (ton/yr)	Controlled Emiss (ton/yr)	
Mill 2 (White Mill)	~~D5~~	~~Mill 2 (White Mill) Mill Vent - will not be present with replacement Hosokawa Mill~~	~~D5~~	~~None~~	~~Irradiated PTFE~~	~~8,760~~	~~0.500~~	~~4,380~~	~~thousand lbs~~		~~Summit Filter P84~~	~~NA~~	~~1.00E+00~~	~~0%~~	~~2.1900~~	~~2.1900~~	~~Filter removal efficiency per Summit Filter P84 specification sheet is 99.99% removal. Conservatively assumed 99.9% removal.~~
	D8	Mill 2 product collector baghouse	D-8	None	Irradiated PTFE	8,760	0.500	4,380	thousand lbs		Summit Filter P84	NA	1.00E+00	0%	2.1900	2.1900	Filter removal efficiency per Summit Filter P84 specification sheet is 99.99% removal. Conservatively assumed 99.9% removal.
Mill 8	C9	Mill 8 product collector baghouse	C-9	None	Irradiated PTFE	8,760	0.200	1,752	thousand lbs		Summit Filter P84	NA	1.00E+00	0%	0.8760	0.8760	Filter removal efficiency per Summit Filter P84 specification sheet is 99.99% removal. Conservatively assumed 99.9% removal.
Mill 10	C12	Mill 10 product collector baghouse	C-12	None	Irradiated PTFE	8,760	0.250	2,190	thousand lbs		Summit Filter P84	NA	1.00E+00	0%	1.0950	1.0950	Filter removal efficiency per Summit Filter P84 specification sheet is 99.99% removal. Conservatively assumed 99.9% removal.

1 Maximum annual throughput and associated emissions in some cases reflect inherent limitations on the supply of scrap PTFE

Attachment 5
DEP7007 Permit Application Forms

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007AI

Administrative Information

___ Section AI.1: Source Information
___ Section AI.2: Applicant Information
___ Section AI.3: Owner Information
___ Section AI.4: Type of Application
___ Section AI.5: Other Required Information
___ Section AI.6: Signature Block
___ Section AI.7: Notes, Comments, and Explanations

Additional Documentation

___ Additional Documentation attached

Source Name: Shamrock Technologies, Inc.
KY EIS (AFS) #: 21-101-00136
Permit #: F-16-012 R1
Agency Interest (AI) ID: 46709
Date:

Section AI.1: Source Information

Physical Location Address: **Street:** 301 Community Drive
City: Henderson **County:** Henderson **Zip Code:** 42420

Mailing Address: **Street or P.O. Box:** Same as above
City: **State:** **Zip Code:**

Standard Coordinates for Source Physical Location

Longitude: -87.641262 (decimal degrees) **Latitude:** 37.805884 (decimal degrees)

Primary (NAICS) Category: All other plastics products manufacturing **Primary NAICS #:** 326199

Classification (SIC) Category: Chemicals and Chemical Preparations NEC **Primary SIC #:** 2899

Briefly discuss the type of business conducted at this site: Shamrock recycles polytetrafluoroethylene (PTFE) by irradiating the ground material and baking irradiated material to process into fresh micropowders for different applications within inks and coatings, etc.

Description of Area Surrounding Source: __ Rural Area __ Urban Area __ Industrial Park X Industrial Area __ Residential Area __ Commercial Area

Is any part of the source located on federal land? __ Yes X No

Number of Employees: 92 (approx)

Approximate distance to nearest residence or commercial property: 700 feet (approx)

Property Area: 11 acres (approx)

Is this source portable? __ Yes X No

What other environmental permits or registrations does this source currently hold or need to obtain in Kentucky?

NPDES/KPDES: X Currently Hold __ Need __ N/A

Solid Waste: __ Currently Hold __ Need X N/A

RCRA: X Currently Hold __ Need __ N/A

UST: __ Currently Hold __ Need X N/A

Type of Regulated Waste Activity:
__ Mixed Waste Generator
X Generator
__ Recycler
__ Other: ______
__ U.S. Importer of Hazardous Waste
__ Transporter
__ Treatment/Storage/Disposal Facility
__ N/A

Section AI.2: Applicant Information

Applicant Name: Shamrock Technologies, Inc.

Title: (if individual)

Mailing Address: **Street or P.O. Box:** 301 Community Drive
City: Henderson **State:** KY **Zip Code:** 42420

Email: (if individual)

Phone: (270) 826-7006

Technical Contact

Name: Susan Haynes

Title: EHS Manager

Mailing Address: **Street or P.O. Box:** 301 Community Drive
City: Henderson **State:** KY **Zip Code:** 42420

Email: shaynes@shamrocktechnologies.com

Phone: (270) 826-7006 EXT 2041

Air Permit Contact for Source

Name: Michael Jussila

Title: Global Manufacturing and Engineering Leader

Mailing Address: **Street or P.O. Box:** 301 Community Drive
City: Henderson **State:** KY **Zip Code:** 42420

Email: mjussila@shamrocktechnologies.com

Phone: (270) 826-7006 EXT 2044

Section AI.3: Owner Information

__ Owner same as applicant

Name: William Neuberg

Title: President

Mailing Address: **Street or P.O. Box:** Foot of Pacific Street

City: Newark **State:** NJ **Zip Code:** 07114

Email: bneuberg@shamrocktechnologies.com

Phone: (973) 286-4889

List names of owners and officers of the company who have an interest in the company of 5% or more.

Name	Position
William Neuberg	Owner and President

Section AI.4: Type of Application

Current Status: __ Title V X Conditional Major __ State-Origin __ General Permit __ Registration __ None

Requested Action:
(check all that apply)

__ Name Change	__ Initial Registration	__ Significant Revision	__ Administrative Permit Amendment
__ Renewal Permit	__ Revised Registration	__ Minor Revision	__ Initial Source-wide OperatingPermit
X 502(b)(10) Change	__ Extension Request	__ Addition of New Facility	__ Portable Plant Relocation Notice
__ Revision	__ Off Permit Change	__ Landfill Alternate Compliance Submittal	__ Modification of Existing Facilities
__ Ownership Change	__ Closure		

Requested Status: __ Title V X Conditional Major __ State-Origin __ PSD __ NSR __ Other: ________

Is the source requesting a limitation of potential emissions? __ Yes X No no change requested to existing HAP limititations

Pollutant:	**Requested Limit:**	**Pollutant:**	**Requested Limit:**
__ Particulate Matter	________	__ Single HAP	________
__ Volatile Organic Compounds (VOC)	________	__ Combined HAPs	________
__ Carbon Monoxide	________	__ Air Toxics (40 CFR 68, Subpart F)	________
__ Nitrogen Oxides	________	__ Carbon Dioxide	________
__ Sulfur Dioxide	________	__ Greenhouse Gases (GHG)	________
__ Lead		__ Other	________

For New Construction:

Proposed Start Date of Construction: *(MM/YYYY)* 06/2022

Proposed Operation Start-Up Date: *(MM/YYYY)* 08/2022

For Modifications:

Proposed Start Date of Modification: *(MM/YYYY)* ________

Proposed Operation Start-Up Date: *(MM/YYYY)* ________

Applicant is seeking coverage under a permit shield. __ Yes __ No

Identify any non-applicable requirements for which permit shield is sought on a separate attachment to the application.

Section AI.5 Other Required Information

Indicate the documents attached as part of this application:

__ DEP7007A Indirect Heat Exchangers and Turbines
__ DEP7007B Manufacturing or Processing Operations
__ DEP7007C Incinerators and Waste Burners
__ DEP7007F Episode Standby Plan
__ DEP7007J Volatile Liquid Storage
__ DEP7007K Surface Coating or Printing Operations
__ DEP7007L Mineral Processes
__ DEP7007M Metal Cleaning Degreasers
__ DEP7007N Source Emissions Profile
__ DEP7007P Perchloroethylene Dry Cleaning Systems
__ DEP7007R Emission Offset Credit
__ DEP7007S Service Stations
__ DEP7007T Metal Plating and Surface Treatment Operations
__ DEP7007V Applicable Requirements and Compliance Activities
__ DEP7007Y Good Engineering Practice and Stack Height Determination
DEP7007AA Compliance Schedule for Non-complying Emission Units
__ DEP7007BB Certified Progress Report

__ DEP7007CC Compliance Certification
X DEP7007DD Insignificant Activities
__ DEP7007EE Internal Combustion Engines
__ DEP7007FF Secondary Aluminum Processing
__ DEP7007GG Control Equipment
__ DEP7007HH Haul Roads
__ Confidentiality Claim
__ Ownership Change Form
__ Secretary of State Certificate
__ Flowcharts or diagrams depicting process
__ Digital Line Graphs (DLG) files of buldings, roads, etc.
__ Site Map
__ Map or drawing depicting location of facility
__ Safety Data Sheet (SDS)
__ Emergency Response Plan
X Other: Emission calculations

Section AI.6: Signature Block

I, the undersigned, hereby certify under penalty of law, that I am a responsible official*, and that I have personally examined, and am familiar with, the information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the information is on knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false or incomplete information, including the possibility of fine or imprisonment.

Michael Jussila
Authorized Signature

June 22, 2022
Date

Michael Jussila
Type or Printed Name of Signatory

Global Manufacturing and Engineering Leader
Title of Signatory

*Responsible official as defined by 401 KAR 52:001.

Division for Air Quality
300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007DD

Insignificant Activities

___ Section DD.1: Table of Insignificant Activities
___ Section DD.2: Signature Block
___ Section DD.3: Notes, Comments, and Explanations

Source Name: Shamrock Technologies, Inc.
KY EIS (AFS) #: 21-101-00136
Permit #: F-16-012 R1
Agency Interest (AI) ID: 46709
Date:

Section DD.1: Table of Insignificant Activities

*Identify each activity with a unique Insignificant Activity number (IA #); for example: 1, 2, 3… etc.

Insignificant Activity #	Description of Activity including Rated Capacity	Serial Number or Other Unique Identifier	Applicable Regulation(s)	Calculated Emissions
~~10~~	~~Mill 2 Mill Vent~~ ~~500 lb/hr PTFE milled~~	~~D5~~	~~401 KAR 59:010~~	This vent is being eliminated for an emissions reduction of PM / PM10 / PM2.5: 0.50 lb/hr, 2.19 ton/yr
11	Hosakawa Mill 2 500 lb/hr PTFE milled	D8	401 KAR 59:010	No credit taken for any emissions reductions
26	Hosakawa Mill 8 200 lb/hr PTFE milled	C9	401 KAR 59:010	No credit taken for any emissions reductions
31	Hosakawa Mill 10 250 lb/hr PTFE milled	C12	401 KAR 59:010	No credit taken for any emissions reductions

Section DD.2: Signature Block

I, THE UNDERSIGNED, HEREBY CERTIFY UNDER PENALTY OF LAW, THAT I AM A RESPONSIBLE OFFICIAL, AND THAT I HAVE PERSONALLY EXAMINED, AND AM FAMILIAR WITH, THE INFORMATION SUBMITTED IN THIS DOCUMENT AND ALL ITS ATTACHMENTS. BASED ON MY INQUIRY OF THOSE INDIVIDUALS WITH PRIMARY RESPONSIBILITY FOR OBTAINING THE INFORMATION, I CERTIFY THAT THE INFORMATION IS ON KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE OR INCOMPLETE INFORMATION, INCLUDING THE POSSIBILITY OF FINE OR IMPRISONMENT.

By:

Michael Jussila
Authorized Signature

June 22, 2022
Date

Michael Jussila
Type/Print Name of Signatory

Global Manufacturing and Engineering Leader
Title of Signatory

Attachment 6
Interim Measures Proposal

SHAMROCK
Particle Innovation • Surface Solutions

Shamrock Technologies, Inc.
301 Community Drive
Henderson, KY USA 42420
Tel: +1-270-826-7006
Fax: +1-270-826-7235
www.shamrocktechnologies.com

June 22, 2022

via e-mail

Larry Hughes
Office of the Commissioner
Kentucky Department for Environmental Protection
300 Sower Boulevard
Frankfort, Kentucky 40601

Re: Shamrock Technologies, Inc.
Agreed Order DOW-19-2-069
AI Nos. 46709, 38464, 46707
Interim Measures Proposal—Mill Replacements at Community Drive

Dear Mr. Hughes,

Please find attached an Interim Measures Proposal in accordance with Agreed Order DOW-19-2-0069 for reduction of PFAS emissions in operations at the Shamrock Technologies, Inc. (Shamrock) Community Drive facility. Shamrock has modified this final submission according to requests received from the Kentucky Division for Air Quality. A Section 502(b)(10) change notification is being simultaneously submitted to the Kentucky Division for Air Quality. Per 401 KAR 52:030 Section 17(2)(b), Shamrock will proceed with these changes within 7 days of this notification unless we hear otherwise from you.

We appreciate the Division's direction in working through these difficult issues in moving forward with control measures to reduce PFAS air emissions as expeditiously as possible.

If you have any questions regarding this proposal, please do not hesitate to contact me.

Sincerely,

Michael Jussila

Michael Jussila
Global Manufacturing and Engineering Leader

cc: Tony Hatton, (KDEP)
Michael Kennedy (KDEP)
Rick Shewekah (KDAQ)
Craig Collins (Shamrock)

22095032.v2
22095032.v4

Shamrock Technologies, Inc.
Community Drive Facility
Agreed Order DOW-19-2-0069
Interim Measures Proposal for Mill Replacements
June 22, 2022

Shamrock Technologies, Inc. (Shamrock) voluntarily entered into Agreed Order DOW-19-2-0069 with the Energy and Environment Cabinet (the Cabinet) on November 1, 2019 for settlement of all alleged violations and deficiencies related to its voluntary disclosure of discovery of Per- and Poly- Flurol-Alkylated Substances (PFAS) found in soil and groundwater samples. Pursuant to the Agreed Order, Shamrock has engaged in on- and off-site characterization, including conducting an inventory of PFAS air emission sources.

On April 23, 2021, the Cabinet directed that continued off-site characterization should include an inventory of primary and secondary PFAS sources. The Cabinet approved Shamrock's Off-Site Characterization Work Plan Phase 2 on September 20, 2021. The field work for this characterization phase was completed in March, 2022 and an off-site characterization report for this phase, including the inventory, is scheduled to be provided to the Cabinet in June, 2022. Pursuant to the Cabinet's April 23, 2021, PFAS air emissions are to be addressed in the Conceptual Site Model and Corrective Action Plan.

Shamrock has diligently analyzed control measures and has identified a general approach for control of air emissions which it shared with the Cabinet on March 31, 2022. Included in the approach are certain control measures Shamrock is prepared to propose as Interim Measures under the Agreed Order. The first interim measure, mill replacements, is the subject of this Interim Measures Proposal[1].

Shamrock proposes to replace Mill 2 with a Hosokawa model 710 mill and to replaced mills 8 and 10 with Hosokawa model 630 mills for reduction of PFAS at the facility.

Background

Mills are utilized to break PTFE into particles to be processed for use by specific customers. The customer use dictates the size of particle to be processed. Mill 2 was installed in 1998; Mills 8 and 10 were installed in the early 2000's. Mill design has significantly evolved since that time. New Hosokawa mills are more precise in their ability to consistently and quickly produce particles greater than 1 micron in size. Mill baghouses have a design efficiency of 99.99% where the

---

[1] Because mills at the Community Drive facility are included in Permit F-16-012 for PM emissions subject to 401 KAR 59:010, Shamrock is simultaneously submitting a 502(b)(10) change to the Division for Air Quality. A copy of this Proposal is attached to the 502(b)(10) change notification. PFAS is neither a regulated pollutant or hazardous air pollutant under the CAA at this time and is not covered under Permit F-16-012 R1. Consequently, air emission control interim measures are being submitted to the Cabinet pursuant to the Agreed Order. At such time as PFAS may become regulated or hazardous air pollutants under the CAA, Shamrock anticipates working with the Cabinet for changes to this approach, if any, that may be required.

particle size is greater than one micron.[2] This helps in reducing particulate matter (PM) emissions which in turn helps reduce PFAS emissions. For purposes of PFAS reduction, the new Hosokawa Mill 2 will only have one vent as opposed to two vents on current Mill 2. The removal of one air vent provides a quantifiable reduction in PFAS emissions. Based on engineering judgement the Hosokawa mills are also expected to result in reduced PFAS emissions from the vents that will remain on replacement Mills 2, 8 and 10. However, to be conservative, Shamrock proposes to only take credit for the quantifiable PFAS reductions provided by the removal of one vent on Mill 2.

PFAS Reductions

As previously stated, Shamrock is replacing existing Mills 2, 8 and 10 with Hosokawa Mills that use newer and more efficient milling technology. The maximum permitted capacity (pounds milled per hour) of the replacement mills will be the same as the existing mills.

Existing Mill 2 has two vents, a mill vent and a product collector vent. Each vent is controlled by a separate baghouse. Existing Mill 2 is the third largest source of PFAS emissions at the Community Drive facility, with total PFAS emissions of 8.69 lb/yr from both vents. The replacement Hosokawa mill for Mill 2 will have only one vent, the product collector vent. This will eliminate one emission point (D-5, Mill 2 Mill Vent) and the associated 6.35 lb/yr of total PFAS emissions. Existing Mills 8 and 10 have only a product collector vent each (no separate mill vent) and will be replaced with Hosokawa mills with one product collector vent each.

PFAS emitted by the mills is in the particulate phase. Significant vapor phase PFAS is not expected because the material is not being heated or irradiated. Therefore, PFAS emissions changes are expected to directionally reflect particulate emissions changes.

In addition to eliminating the Mill 2 Mill vent, the replacement mill project is expected to achieve additional PFAS emission reductions due to the improved milling technology used by the new Hosokawa mills. These additional expected emission reductions are due to:

- Less milling air used (i.e., the same amount of material will be milled using significant less milling air)
- The lower milling air rates will result in lower exhaust flow rates and therefore lower air to cloth ratios, which are expected to improve the baghouse particulate removal efficiency. Because PFAS is a particulate, this will reduce PFAS emissions.
- The Hosakawa mills produce more accurately sized materials with a particle size distribution much closer to the target diameters, with fewer of the smaller (less than 1 micron) particles that are not desired in the Shamrock products. Because the replacement mills will produce

---

[2] The baghouses operate within the manufacturer specified parameter. The only parameter that the bag filter manufacturer provides is nominal air permeability (cfm/ft2). Attachment 2 to the Section 502(b)(10) submittal provides the filter manufacturer specification sheet and a calculation of the air to filter ratio (cfm/ft2) demonstrating that it does not exceed the manufacture specification.

fewer particles less than 1 micron, a higher percentage of particles is expected to be captured by the baghouses.

It is difficult to precisely quantify the emissions reduction achieved by the above factors so this application does not take credit for any emissions reductions other than from the elimination of the Mill 2 Mill Vent (Emission Point D-5). However, based on engineering judgement Shamrock believes that there will be PFAS emissions reductions from the remaining vents.

Detailed emission calculations are provided in Attachment 1 to this proposal. Table 1 below, and Attachment 1, provides a summary of the estimated PFAS emission reductions. Table 2 shows the 2019 stack test emission factor for Mill 2 Mill vent that is being removed. These factors were in turn used to estimate hourly potential emissions (Table 3) at the hourly permitted mill capacity, actual annual emissions (Table 4) at actual annual production rates used for the 2019 PFAS study, and potential emission rates (Table 5) at continuous operation.

The following table summarizes the PFAS emissions change.

Known Emission Reductions									
	Hourly Emissions (lb/hr total PFAS)			**Annual Actual Emissions (lb/yr total PFAS)**			**Annual PTE Emissions (lb/yr total PFAS)**		
	Existing	**Replace-ment**	**Change**	**Existing**	**Replace-ment**	**Change**	**Existing**	**Replace-ment**	**Change**
Mill 2 Mill Vent[1]	1.83E-03	0	**-1.83E-03**	6.35	0	**-6.35**	16.06	0	**-16.06**
1 Replacement Mill 2 will have only one emission point. Mill vent on existing Mill 2 will not exist in new configuration.									

Implementation of this Interim Measure

As stated during our March 31, 2022 meeting, Shamrock proposes to begin installation of the new mills in the third quarter of this year. Our current expectation is to replace Mill 2 by August, 2022 and to replace Mills 8 and 10 by the end of the year. Shamrock reserve the ability to extend those time frames on the basis of supply chain issues if necessary. Otherwise, Shamrock, like KDEP, is anxious to install preventative measures as quickly as is feasible.

ERM

901 Woodland Street
Suite 104
Nashville, Tennessee

T +1 615 656 7100

erm.com

Kentucky Division of Air Quality
Michael Kennedy, Director
300 Sower Boulevard
2nd Floor
Frankfort, KY 40601

DATE
December 4, 2025

SUBJECT
Minor Permit Revision Application
For Addition of an Oven
Shamrock Technologies, Inc.
Agency Interest 46709

REFERENCE
0656051

Dear Mr. Kennedy:

This permit application is a revision to the initial application dated October 30, 2025. This permit application replaces the initial application submission in total.

Shamrock Technologies, Inc. (Shamrock) operates a facility in Henderson, Kentucky that recycles polytetrafluoroethylene (PTFE). The PTFE used in the process is sourced from industrial, pre-consumer materials, including scrap and off-spec materials. Some of this material contains pigments or oil residues although currently not a common material processed.

The facility currently operates under Conditional Major Permit F-16-012 R1, originally issued on July 8, 2016, and later revised on May 3, 2018. The permit expiration date was July 8, 2021. A renewal permit application was prepared and submitted on January 4, 2021 and later revised on November 22, 2021. Shamrock is operating under the application shield because it submitted an administratively complete and timely permit renewal application at least 6 months prior to the expiration of the permit. This is corroborated by Section 12(2) of 401 KAR 52:030 and Section G(2)(a) of the existing permit.

1. APPLICATION OBJECTIVE

This permit application objective is to:

- Add a tray oven to the facility for a total of five.
- Increase the maximum average oven batch processing rates to 225 pounds per hour (lb/hr) due to the oven capacity increase to 3,600 pounds per batch (lb/batch).
- Maintain the permit as a conditional major for Hazardous Air Pollutants (HAP).
- The existing ovens scrubber (Scrubber 1) will service the five tray ovens.

2. OPERATIONS DESCRIPTION

A description of the operation, equipment and the associated air pollution control device is provided on Kentucky Division of Air Quality forms in Attachment A. Attachment A also contains a process flow diagram.

Tray ovens receive powdered material that was irradiated in one of the three Electron Beam (E-Beam) units located upstream:

- The ICT E-Beam;
- E-Beam 3; or
- Dynamitron E-Beam

The E-Beam technology in this application is used to break the PTFE polymer chain into smaller molecular weight polymers that can be used by Shamrock's customers.

Tray ovens remove fluorides from the material to meet customer demand. This project increases the number of ovens from four to five with a capacity of 3,600 lb/batch, each.

The PTFE is irradiated with either a high dose (recycled material) or low dose (virgin material). Materials that have had low dosed irradiation treatment are not considered for emissions calculations since they result in considerably smaller emission rates. The high dosed material was assumed to be processed for the entire time to represent the worst-case scenario for emissions. A minimum batch cycle time of 16 hours is used to calculate the worst case (highest) average processing rate. The maximum batch average processing rate of 225 lb/hr was derived by a maximum of 3,600 lb/batch ÷ 16 hr/batch). This processing rate is used to calculate potential emissions from the tray ovens.

A process flow diagram is provided in Figure 1 of Attachment A depicting the process flow with respect to the tray ovens.

2.1 AIR POLLUTION CONTROL

The tray ovens have a wet scrubber to control hydrogen fluoride emissions to:

- Meet ambient air quality standards for fluorides expressed as hydrogen fluoride (HF); and
- Be classified as an area source of HAP HF emissions

The additional oven will be serviced by Scrubber 1 which already services the 4 existing ovens. Scrubber 1 has enough capacity to accommodate this additional oven. The capacity of Scrubber 1 (Fisher-Klosterman PBS-480) is rated at 6000 cfm. While the total requirement of the five ovens is presented in Table 2-1.

TABLE 2-1. OVEN VENTIALLATION REQUIREMENTS

Oven (ID)	Ventilation Requirement (cfm)
Tray Oven 1 (D9)	1,000
Tray Oven 2 (D11)	1,000
Tray Oven 3 (D12)	1,000
Tray Oven 4 (D13)	1,000
Tray Oven 5 (D14)	1,200
Total Ovens	5,200

Scrubber 1 capacity to accommodate the five ovens is well within the ovens' ventilation demand.

3. EMISSION RATES

Emission rates, emission factors, associated processing rates and scrubber performances are provided in the forms in Attachment A and summary of emission calculations in Attachment B. Table 3-3 contains the Potential to Emit (PTE) from the entire facility. With exception to HF and volatile organic compounds (VOC), emission factors from the ovens were obtained from the Permit Renewal Application revision dated November 22, 2021. The HF emission factor was developed from a recent engineering test which is supplied in Attachment E of this permit application. The VOC emission factor is similar to the HF emission factor and was adjusted accordingly and is assessed in the PTE calculation summaries of Attachment B.

3.1 EMISSION FACTORS

The emission factors for this analysis were identical to the emission factors reported in the last revision of the renewal permit application. However, a newer uncontrolled HF emission factor was developed from a recent engineering test and measurements of an HF emission profile over a batch period which is provided in Attachment E. For the ovens, the VOC emission factors have been found to be similar to the HF emission factors and are calculated in Attachment B.

3.1.1 DERIVATION OF THE UNCONTROLLED HF EMISSION FACTOR

An engineering test performed on March 27, 2025 yielded an uncontrolled 3-test run average of 2.66 lb/hr while processing a 5,400-pound batch of PTFE. The test runs represent emissions released at the beginning of the bake phase when the maximum emissions of the oven batch occurred.

An oven emission profile conducted in 2009 where HF emission concentrations and corresponding flow rates were measured at approximately one-minute intervals over 13.7 hours was used to evaluate how the emissions varied during a batch. This showed a rise in emissions at the beginning of the batch. It was followed by a decay-like trend after a peak as the batch progressed.

This data was broken into one-hour blocks by averaging the emission rates within each block. A percentage of the maximum emission rate for each block was calculated. The percentage calculated for each block were added together to yield a batch emission rate that equaled 369% of the maximum block emission rate. The batch emission rate was rounded up to 400% for further use in deriving a conservative emission factor based on a March 2025 engineering test. This means that the average of the batch maximum emission rates of 2.66 lb/hr emitted over a period of 4 hours (369% rounded up to 400%) would equal the HF emissions released in the tested batch. The mathematical derivation is calculated in the following:

$$\frac{2.66\ lb\ HF/hr \times 4\ hr\ of\ emissions\ /batch}{5{,}400\ lb\ PTFE\ /batch} = 1.97 \times\ 10^{-3}\ lb\ HF/lb\ PTFE$$

3.1.2 DERIVATION OF THE VOC EMISSION FACTOR

The uncontrolled emission factor and the VOC emission factor are related. Therefore, the VOC emission factor calculated during the 2018 test for HF and VOC were ratioed to derive the emission factor that corresponded to the emission factor derived from the March uncontrolled HF emission factor. The VOC emission factor derivation follows.

$$1.97 \times 10^{-3}\ lb\ HF/lb\ PTFE \times \frac{1.82 \times 10^{-3}\ lb\ VOC\ in\ 2018/lb\ PTFE\ in\ 2018}{1.83 \times 10^{-3}\ lb\ HF\ in\ 2018/lb\ PTFE\ in\ 2018} = 1.96 \times 10^{-3}\ lb\ VOC/lb\ PTFE$$

3.2 POTENTIAL TRAY OVEN EMISSIONS

Potential hourly tray oven emissions were based on a worst-case average batch processing rate of 225 lb/hr and emission factors developed from source testing. The resultant hourly emission rate was multiplied by 8760 hours per year (hr/yr) for a potential emission rate used to calculate the facilty Potential to Emit (PTE). Table 3-1 provides the controlled level potential emissions from the ovens.

TABLE 3-1. POTENTIAL CONTROLLED EMISSIONS FROM FIVE OVENS

Regulated Pollutant	Hourly Emission Rate (lb/hr)	Annual Emission Rate (ton/yr)
PM/PM10	1.76	7.69
VOC	2.21	9.66
CO	0.067	0.29
HF HAP	0.111	0.49
HCl HAP	0.0031	0.014
GHG	220	963

3.3 MAXIMUM HOURLY EMISSIONS FOR AIR DISPERSION MODELING

Tray oven maximum HF emissions used for air dispersion modeling was the highest hourly emission rate averaged over a 12-hour period which corresponds to the lowest short term fluoride ambient air standard. To derive this highest emission rate, the emission factor was multiplied by a 300 pound per hour processing rate (unlike the maximum average processing rate of 225 pounds per hour). The 300 pound per hour processing rate corresponds to a 12-hour average batch time which is shorter than the minimum batch time of 16 hours and will yield a more conservative emission rate when applied to the emission factor for an hourly emission rate. This emission rate was used for modeling the four ambient air quality standards for fluorides as HF.

3.4 MAXIMUM ANTICIPATED EMISSION RATE

This project is expected not to exceed the maximum average emission rate of 150 lb of PTFE processed per hour. This is an annual average. Table 3-2 provides the hourly average emission rate and annual expected from processing PTFE at 150 lb/hr, extrapolated to 8760 hours per year.

TABLE 3-2. MAXIMUM AVERAGE ANTICIPATED OVENS EMISSIONS

Regulated Pollutant	Hourly Emission Rate (lb/hr)	Annual Emission Rate (ton/yr)
PM/PM10	1.170	5.12

Regulated Pollutant	Hourly Emission Rate (lb/hr)	Annual Emission Rate (ton/yr)
VOC	1.470	6.44
CO	0.045	0.20
HF HAP	0.074	0.32
HCl HAP	0.002	0.01
GHG	147	642

3.5 FACILITY POTENTIAL TO EMIT

Emission rates, emission factors, associated processing rates and scrubber performance for the tray ovens are provided in the forms in Attachment A. Summary of emission calculations are provided in Attachment B. Table 3-3 contains the PTE from the entire facility. Detailed emissions from the Tray Ovens are given in Attachment B; however, emissions from the rest of the facility were obtained from the Permit Renewal Application revision dated November 22, 2021.

TABLE 3-3. FACILITY POTENTIAL TO EMIT

Regulated Air Pollutant	ICT E-Beam (ton/yr)	E-Beam 3 (ton/yr)	Dynamitron E-Beam (ton/yr)	Five Tray Ovens (ton/yr)	Insignificant Activities (ton/yr)	Facility (ton/yr)
PM/PM10	0.81	0.62	7.90E-04	7.69	0.88	9.99
VOC	23.93	37.40	17.72	9.66	4.60E-3	88.71
CO	1.63	1.90	0.64	0.29	7.20E-02	4.53
NOx	0.52	-	-	-	8.6E-02	0.61
SO2	3.1E-03	-	-	-	5.20E-04	3.6E-03

Regulated Air Pollutant	ICT E-Beam (ton/yr)	E-Beam 3 (ton/yr)	Dynamitron E-Beam (ton/yr)	Five Tray Ovens (ton/yr)	Insignificant Activities (ton/yr)	Facility (ton/yr)
HF HAP	1.00	1.39	0.65	0.49	-	3.52
HCl HAP	0.024	0.038	0.024	0.014	-	0.100
Formaldehyde HAP	0.017	0.027	0.14	-	-	0.18
Co HAP	-	-	1.70E-06	-	-	1.70E-06
Total HAP	1.04	1.46	0.81	0.50	-	3.81
GHG (ton CO_2e)	6,973	10,162	3,421	963	102	21,621

4. REGULATORY ANALYSIS

Permitting and regulatory standards are discussed in this section. This facility is a conditional major stationary source. A Federally Enforceable permit for non-major sources has been issued for this facility because its PTE is less than Title V major source emissions thresholds. Additionally, this source is not subject to National Emission Standards for Hazardous Air Pollutants (NESHAP). The following sections list standards to which this project is subject and potentially applicable standards to which the standard is not subject.

4.1 FEDERAL EMISSION STANDARDS

A review of the federal standards did not show that federal standards were applicable to this project. This project heats PTFE polymers to drive off fluorides. Potentially applicable standards are addressed in the following.

4.1.1 NEW SOURCE PERFORMANCE STANDARDS (NSPS)

Currently, the facility has four existing tray ovens. The project locates one additional oven (D14) to the facility. The following addresses NSPS standards that are potentially applicable to the project. Rationale is provided why these standards are not applicable.

4.1.1.1 VOLATILE ORGANIC COMPOUND EMISSIONS FROM THE POLYMER MANUFACTURING INDUSTRY - 40 CFR 60 SUBPART DDD

The ovens drive off fluorides but the polymer exiting the oven is still a PTFE. 40 CFR 60.560(a) of this subpart applies to the manufacturing of polypropylene, polyethylene, polystyrene, or poly (ethylene terephthalate) and does not include PTFE in the applicability statement. Therefore, this standard does not apply to the additional tray oven to be located at the facility.

4.1.1.2 VOLATILE ORGANIC COMPOUND EMISSIONS FROM SYNTHETIC ORGANIC CHEMICAL MANUFACTURING INDUSTRY REACTOR PROCESSES – 40 CFR 60 SUBPART RRR(A)

40 CFR § 60.700a(a) of this standard applies to a process unit that produces as a product, co-product, byproduct or intermediate any of the chemicals tabulated in 40 CFR 60 § 60.707a. Because PTFE is not listed in this table, this NSPS does not apply to the tray oven which will be located to the facility.

4.1.2 NESHAP

This stationary source does not contain regulated source categories for the NESHAP rules in 40 CFR 61 and 63 except for 40 CFR 61 Subpart M. 40 CFR 61 Subpart M is a standard for renovation and demolition of materials containing asbestos. The facility can potentially have materials with asbestos. Therefore, an assessment will have to be done prior to a demolition or renovation project to assure inapplicability or applicability of this standard.

This stationary source is an area source due to the limits listed in Condition 3 to Section D of the facility’s Permit Number F-16-012 R1. Therefore, major source standards do not apply to this stationary source and only area source NESHAPs are addressed in the following.

4.1.2.1 CHEMICAL MANUFACTURING AREA SOURCES - 40 CFR 63 SUBPART VVVVVV

This standard applies to chemicals in feedstock, chemicals generated as byproduct or product specified in 40 CFR § 63.11494(2). None of these NESHAP listed chemicals are present in the feedstock, generated as byproduct or product at the facility. Therefore, the operations at the facility and project do not apply to this NESHAP.

4.1.2.2 CHEMICAL PREPARATIONS INDUSTRY – 40 CFR 63 SUBPART BBBBBBB

According to 40 CFR § 63.11579(a), milling operations that process material or comes in contact with material that has:

- compounds of chromium (VI), lead, or nickel in amounts greater than or equal to 0.1 percent by weight (as the metal), or
- compounds of manganese or chromium (III) in amounts greater than or equal to 1.0 percent by weight (as the metal).

Because milling activities at the facility process materials that are not known to contain the metals noted above, this standard does not apply to this project or facility.

4.2 STATE PERMITTING RULES AND STANDARDS

The following rules have been evaluated for applicability to the project.

4.2.1 MINOR PERMIT REVISIONS – SECTION 14 TO 401 KAR 52:030

The location of an additional tray oven to the site maintains the facility's Federally Enforceable Permit for Nonmajor Sources' status. This project qualifies for a minor permit revision because it meets the following criteria in Section 14(1) of this permitting rule.

4.2.1.1 CRITERIA FOR ALLOWING MINOR PERMIT REVISION PROCEDURES

The criteria and rationale are detailed in the following.

Do not violate an applicable requirement.

A review of the total facility regulated air pollutant emission rates were made and were found to be less than Title V major source thresholds. HF emissions were modeled with a total of five tray ovens operating at maximum capacity and were found to meet ambient air quality standards for gaseous fluorides expressed as HF. Applicable requirements are not violated.

Do not involve significant changes to existing monitoring, recordkeeping or reporting.

No significant change in monitoring, recordkeeping and reporting is expected as a result of the addition of a tray oven. The revised permit will have to replace the current language requiring the testing of Ovens D12 and D13 with a requirement to test for Oven D14.

Do not require or change a case-by-case determination.

This change does not:

1. Trigger a prevention of significant deterioration (PSD) that will require a Best Available Control Technology (BACT) analysis because the facility is not a New Source Review (NSR) major source;
2. Impact a nonattainment area (based on being more than a 25-mile distance from one) requiring Reasonable Available Control Technology (RACT) for non-major sources of emission; or
3. Impact a regional haze area requiring Best Available Reduction Technology (BART). The screening of sources of emissions earmarked for BART have a potential to emit 250 tons per year or more of any regulated air pollutant and has a facility that was in existence between August 7, 1962 and August 7, 1977. Shamrock site was founded after 1977 and has a potential to emit less than 250 tons per year for any pollutant. Furthermore, this facility has not been identified by the KDAQ as a significant contributor to regional haze.
4. Trigger a visibility impairment requirement due to PSD requirement because the facility is not a major NSR source;

5. Trigger an increment analysis due to a PSD requirement because the facility is not a major NSR source or has been required to conduct an increment analysis as a result of modeling another major source in its vicinity; or
6. Trigger a Section 112(g) new construction MACT since the aggregate tray ovens are not major for HAP.

Do not seek to establish or change a permit term or condition for which there is no corresponding underlying applicable requirement.

This change:

1. Does not require a federally enforceable emissions cap to avoid an air pollution control program. One is already in place for HAP emissions in the permit and is sufficient to accommodate the maximum emissions for this project.
2. Does not enable a voluntary early reduction for a NESHAP (42 USC 7412(i)(5)) that requires a case-by-case emissions control for HAP.

Is not a modification under Title I of the Clean Air Act.

This change:

1. Does not trigger a NSPS. See Section 4.1.1 of this permit application.
2. Does not trigger a PSD modification because the facility's potential to emit is less than major NSR thresholds.
3. Does not trigger a NESHAP standard that requires a Title V permit application.

Does not require to be processed as a significant permit revision.

This permit application does not increase the potential to emit that exceeds Title V thresholds; thereby disqualifying the use of a minor permit revision and requiring the use of a Title V permit application. Therefore, this permit application does not require a significant permit revision.

4.2.1.2 SUMMARY OF MINOR PERMIT REVISION

The following summarizes the elements of the minor permit revision.

Description of change and the resulting change in emissions.

The changes are described in Section 1 of the permit application. The resulting change in emissions are listed in Table 4-1.

TABLE 4-1. CHANGE IN POTENTIAL EMISSIONS IN TONS PER YEAR

Scenario	PM/PM10	VOC	CO	HF	HCl	GHG
Projected Oven Potential Emissions	7.69	9.66	0.293	0.485	0.014	963
Existing Oven Potential Emissions	1.37	1.60	0.052	0.114	0.002	188
Change in Oven Emissions	+6.32	+8.06	+0.241	+0.372	+0.011	+775

New requirements that apply after the change.

Refer to Section 1 and Attachment C of this permit application.

Certification.

Based on the criteria and rationale above the changes meet the criteria for use of minor permit revision procedures and the facility requests their use.

Suggested draft permit language.

See Attachment C.

4.2.2 AMBIENT AIR QUALITY STANDARDS – 401 KAR 53:010

Gaseous Fluorides (expressed as HF) are addressed in this section. Air dispersion modeling has been performed to demonstrate project compliance with these requirements. The modeling is addressed in Attachment D. The results of the air quality analysis demonstrate that the project complies with the gaseous fluorides standards.

Compliance source testing will be conducted to verify the controlled HF oven emission rates used in the air dispersion model.

If you have any questions, feel free to reach out to Michael Jussila at mjussila@shamrocktechnologies.com or me at jeff.twaddle@erm.com.

Sincerely,

Jeffrey H. Twaddle, P.E.
Partner at ERM

Cc: Michael Jussila, Shamrock Technologies
Roger Akel, ERM

ATTACHMENT A KDAQ FORMS

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007AI

Administrative Information

___ Section AI.1: Source Information
___ Section AI.2: Applicant Information
___ Section AI.3: Owner Information
___ Section AI.4: Type of Application
___ Section AI.5: Other Required Information
___ Section AI.6: Signature Block
___ Section AI.7: Notes, Comments, and Explanations

Additional Documentation

___ Additional Documentation attached

Source Name: Shamrock Technologies, Inc.
KY EIS (AFS) #: 21- 101-00136
Permit #: F-16-012 R1
Agency Interest (AI) ID: 46709
Date: 12/4/2025

Section AI.1: Source Information

Physical Location Address:	**Street:**	301 Community Drive				
	City:	Henderson	**County:**	Henderson	**Zip Code:**	42420
Mailing Address:	**Street or P.O. Box:**	301 Community Drive				
	City:	Henderson	**State:**	KY	**Zip Code:**	42420

Standard Coordinates for Source Physical Location

Longitude: -87.641262 (decimal degrees) **Latitude:** 37.805884 (decimal degrees)

Primary (NAICS) Category: All other Misc Plastics Products Manufacturing **Primary NAICS #:** 326199

#

Classification (SIC) Category: Chemicals and Chemical Preparations NEC **Primary SIC #:** 2899

Briefly discuss the type of business conducted at this site: Shamrock recycles polytetrafluorethylene (PTFE) by irradiating the ground material and baking irradiated material to process into fresh micropowders for different applications within inks and coatings, etc.

Description of Area Surrounding Source: ☐ Rural Area ☑ Industrial Park ☐ Residential Area ☐ Urban Area ☐ Industrial Area ☐ Commercial Area

Is any part of the source located on federal land? ☐ Yes ☑ No

Number of Employees: 92 (approx)

Approximate distance to nearest residence or commercial property: *700 ft (approx)*

Property Area: **11 acres (approx)**

Is this source portable? ☐ Yes ☑ No

What other environmental permits or registrations does this source currently hold or need to obtain in Kentucky?

NPDES/KPDES:	☑ Currently Hold	☐ Need	☐ N/A
Solid Waste:	☐ Currently Hold	☐ Need	☑ N/A
RCRA:	☑ Currently Hold	☐ Need	☐ N/A
UST:	☐ Currently Hold	☐ Need	☑ N/A

Type of Regulated Waste Activity:
☐ Mixed Waste Generator ☑ Generator ☐ Recycler ☐ Other: ______________
☐ U.S. Importer of Hazardous Waste ☐ Transporter ☐ Treatment/Storage/Disposal Facility ☐ N/A

Section AI.2: Applicant Information

Applicant Name: Shamrock Technologies, Inc.

Title: (if individual)

Mailing Address:
Street or P.O. Box: 301 Community Dr.
City: Henderson **State:** KY **Zip Code:** 42420

Email: (if individual)

Phone: (270) 826-7006

Technical Contact

Name: Michael Chesnut

Title: Process Engineer

Mailing Address:
Street or P.O. Box: 301 Community Dr
City: Henderson **State:** KY **Zip Code:** 42420

Email: MChesnut@shamrocktechnologies.com

Phone: (270) 826-7006

Air Permit Contact for Source

Name: Michael Jussila

Title: Environmental Leader

Mailing Address:
Street or P.O. Box: 301 Community Dr
City: Henderson **State:** KY **Zip Code:** 42420

Email: mjussila@shamrocktechnologies.com

Phone: (270) 826-7006

Section AI.3: Owner Information

☑ **Owner same as applicant**

Name: Shamrock Technologies, Inc.

Title:

Mailing Address:
Street or P.O. Box: Foot of Pacific Street
City: Henderson **State:** KY **Zip Code:** 42420

Email: bneuberg@shamrocktechnologies.com

Phone: (973)286-4899

List names of owners and officers of the company who have an interest in the company of 5% or more.

Name	Position
William Neuberg	Owner

Section AI.4: Type of Application

Current Status: ☐ Title V ☑ Conditional Major ☐ State-Origin ☐ General Permit ☐ Registration ☐ None

Requested Action: *(check all that apply)*

☐ Name Change ☐ Initial Registration ☐ Significant Revision ☐ Administrative Permit Amendment
☐ Renewal Permit ☐ Revised Registration ☑ Minor Revision ☐ Initial Source-wide OperatingPermit
☐ 502(b)(10)Change ☐ Extension Request ☐ Addition of New Facility ☐ Portable Plant Relocation Notice
☐ Revision ☐ Off Permit Change ☐ Landfill Alternate Compliance Submittal ☐ Modification of Existing Facilities
☐ Ownership Change ☐ Closure

Requested Status: ☐ Title V ☑ Conditional Major ☐ State-Origin ☐ PSD ☐ NSR ☐ Other: ____________

Is the source requesting a limitation of potential emissions? ☐ Yes ☑ No

No change requested to existing HAP limitations

Pollutant:	**Requested Limit:**	**Pollutant:**	**Requested Limit:**
☐ Particulate Matter		☐ Single HAP	
☐ Volatile Organic Compounds (VOC)		☐ Combined HAPs	
☐ Carbon Monoxide		☐ Air Toxics (40 CFR 68, Subpart F)	
☐ Nitrogen Oxides		☐ Carbon Dioxide	
☐ Sulfur Dioxide		☐ Greenhouse Gases (GHG)	
☐ Lead		☐ Other	

For New Construction:

Proposed Start Date of Construction: *(MM/YYYY)* ____________

Proposed Operation Start-Up Date: *(MM/YYYY)* ____________

For Modifications:

Proposed Start Date of Modification: *(MM/YYYY)* 03/2026

Proposed Operation Start-Up Date: *(MM/YYYY)* 04/2026

Applicant is seeking coverage under a permit shield. ☐ **Yes** ☑ **No**

Identify any non-applicable requirements for which permit shield is sought on a separate attachment to the application.

Section AI.5 Other Required Information

Indicate the documents attached as part of this application:

- ☐ DEP7007A Indirect Heat Exchangers and Turbines
- ☑ DEP7007B Manufacturing or Processing Operations
- ☐ DEP7007C Incinerators and Waste Burners
- ☐ DEP7007F Episode Standby Plan
- ☐ DEP7007J Volatile Liquid Storage
- ☐ DEP7007K Surface Coating or Printing Operations
- ☐ DEP7007L Mineral Processes
- ☐ DEP7007M Metal Cleaning Degreasers
- ☑ DEP7007N Source Emissions Profile
- ☐ DEP7007P Perchloroethylene Dry Cleaning Systems
- ☐ DEP7007R Emission Offset Credit
- ☐ DEP7007S Service Stations
- ☐ DEP7007T Metal Plating and Surface Treatment Operations
- ☑ DEP7007V Applicable Requirements and Compliance Activities
- ☐ DEP7007Y Good Engineering Practice and Stack Height Determination
- ☐ DEP7007AA Compliance Schedule for Non-complying Emission Units
- ☐ DEP7007BB Certified Progress Report
- ☐ DEP7007CC Compliance Certification
- ☐ DEP7007DD Insignificant Activities
- ☐ DEP7007EE Internal Combustion Engines
- ☐ DEP7007FF Secondary Aluminum Processing
- ☐ DEP7007GG Control Equipment
- ☐ DEP7007HH Haul Roads
- ☐ Confidentiality Claim
- ☐ Ownership Change Form
- ☐ Secretary of State Certificate
- ☑ Flowcharts or diagrams depicting process
- ☐ Digital Line Graphs (DLG) files of buldings, roads, etc.
- ☐ Site Map
- ☐ Map or drawing depicting location of facility
- ☐ Safety Data Sheet (SDS)
- ☐ Emergency Response Plan
- ☐ Other: ____________________

Section AI.6: Signature Block

I, the undersigned, hereby certify under penalty of law, that I am a responsible official*, and that I have personally examined, and am familiar with, the information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the information is on knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false or incomplete information, including the possibility of fine or imprisonment.

Michael Jussila
Authorized Signature

12/4/2025
Date

Michael Jussila
Type or Printed Name of Signatory

Environmental Leader
Title of Signatory

*Responsible official as defined by 401 KAR 52:001.

Section AI.7: Notes, Comments, and Explanations

Tray Ovens

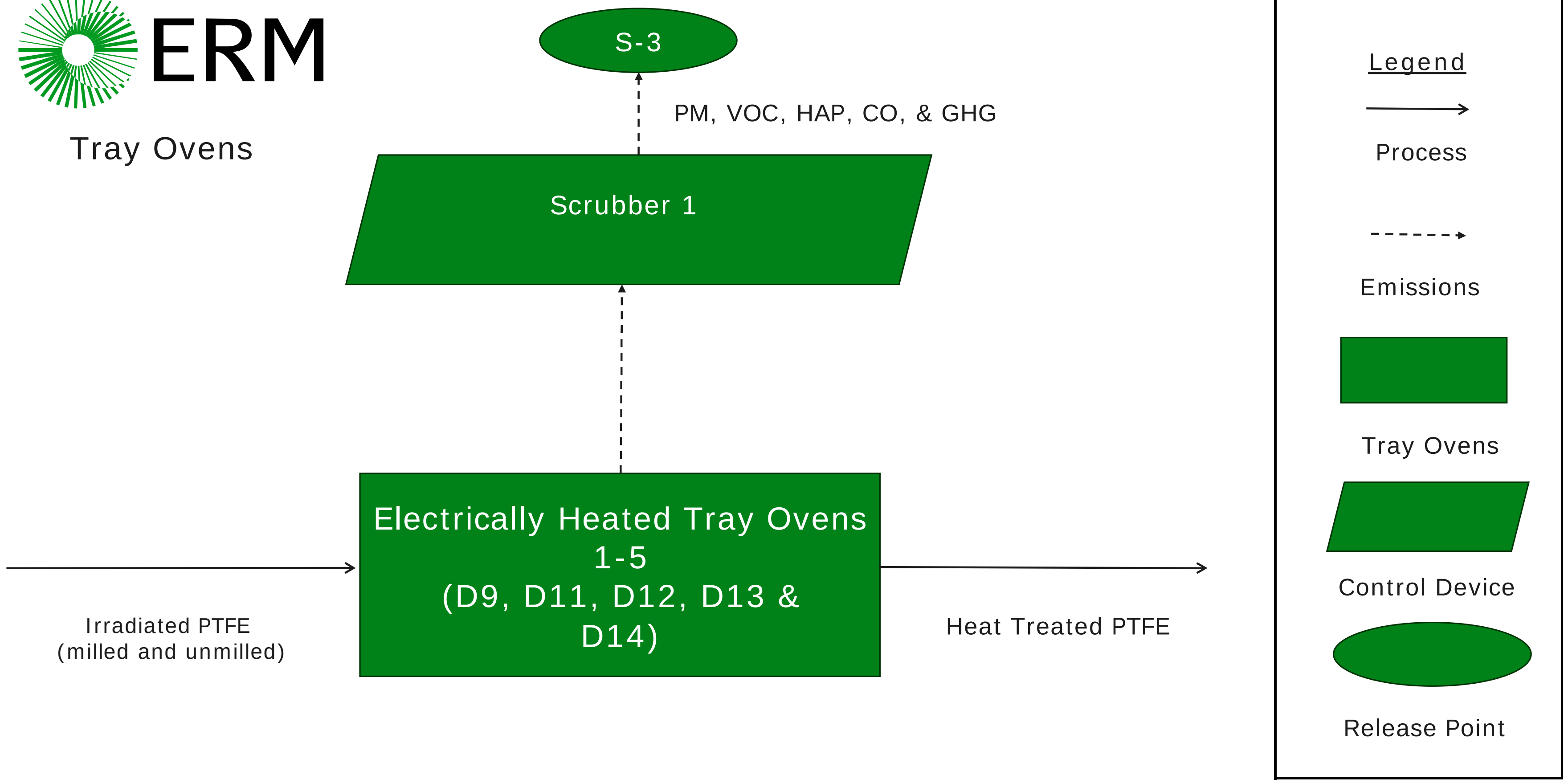

Figure 1
Process Flow Diagram

Shamrock Technologies, Inc.
301 Community Dr.
Henderson, KY 42420
USA

901 Woodland St
Nashville, TN 37206

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007B

Manufacturing or Processing Operations

___ Section B.1: Process Information
___ Section B.2: Materials and Fuel Information
___ Section B.3: Notes, Comments, and Explanations

Additional Documentation

___ Complete DEP7007AI, DEP7007N, DEP7007V, and DEP7007GG.
___ Attach a flow diagram
___ Attach SDS

Source Name: **Shamrock Technologies, Inc.**
KY EIS (AFS) #: **21- 101-00136**
Permit #: **F-16-012-R1**
Agency Interest (AI) ID: **46709**
Date: **12/4/2025**

Section B.1: Process Information

Emission Unit #	Emission Unit Name	Describe Emission Unit	Process ID	Process Name	Manufacturer	Model No.	Proposed/Actual Date of Construction Commencement *(MM/YYYY)*	Is the Process <u>Continuous</u> or <u>Batch</u>?	Number of Batches per 24 Hours *(if applicable)*	Hours per Batch *(if applicable)*
D9	Tray Oven 1	Tray Oven 1- existing equipment	D9	Tray Oven 1	Custom	NA	01/2007	Batch	Varies	16 hours min. for high dose
D11	Tray Oven 2	Tray Oven 2- existing equipment	D11	Tray Oven 2	Custom	NA	02/2016	Batch	Varies	16 hours min. for high dose
D12	Tray Oven 3	Tray Oven 3- existing equipment	D12	Tray Oven 3	Custom	NA	03/2018	Batch	Varies	16 hours min. for high dose
D13	Tray Oven 4	Tray Oven 4- existing equipment	D13	Tray Oven 4	Custom	NA	03/2018	Batch	Varies	16 hours min. for high dose
D14	Tray Oven 5	Tray Oven 5	D14	Tray Oven 5	Custom	NA	03/2026	Batch	Varies	16 hours min. for high dose
D15	Tray Oven 6									
D16	Tray Oven 7									

Section B.2: Materials and Fuel Information

**Maximum yearly fuel usage rate only applies if applicant request operating restrictions through federally enforceable limitations.*

Emission Unit #	**Emission Unit Name**	**Name of Raw Materials Input**	**Maximum Quantity of Each Raw Material Input**		**Total Process Weight Rate for Emission Unit** *(tons/hr)*	**Name of Finished Materials**	**Maximum Quantity of Each Finished Material Output**		**Fuel Type**	**Maximum Hourly Fuel Usage Rate**		**Maximum Yearly Fuel Usage Rate**		**Sulfur Content** *(%)*	**Ash Content** *(%)*
				(Specify Units/hr)				*(Specify Units/hr)*			*(Specify Units)*		*(Specify Units)*		
D9	Tray Oven 1	Plastic for recycling	3600	lb/batch	0.1125	Recycled Plastic	3600	lb/batch	Electric	NA	NA	NA	NA	NA	NA
D11	Tray Oven 2	Plastic for recycling	3600	lb/batch	0.1125	Recycled Plastic	3600	lb/batch	Electric	NA	NA	NA	NA	NA	NA
D12	Tray Oven 3	Plastic for recycling	3600	lb/batch	0.1125	Recycled Plastic	3600	lb/batch	Electric	NA	NA	NA	NA	NA	NA
D13	Tray Oven 4	Plastic for recycling	3600	lb/batch	0.1125	Recycled Plastic	3600	lb/batch	Electric	NA	NA	NA	NA	NA	NA
D14	Tray Oven 5	Plastic for recycling	3600	lb/batch	0.1125	Recycled Plastic	3600	lb/batch	Electric	NA	NA	NA	NA	NA	NA

Section B.3: Notes, Comments, and Explanations

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Source Emissions Profile

__ Section N.1: Emission Summary
__ Section N.2: Stack Information
__ Section N.3: Fugitive Information
__ Section N.4: Notes, Comments, and Explanations

Additional Documentation

___ Complete DEP7007AI

Source Name: Shamrock Technologies, Inc.
KY EIS (AFS) #: **21-** 101-00136
Permit #: F-16-012-R1
Agency Interest (AI) ID: 46709
Date: 12/4/2025

N.1: Emission Summary

Emission Unit #	Emission Unit Name	Process ID	Process Name	Control Device Name	Control Device ID	Stack ID	Maximum Design Capacity *(SCC Units/hour)*	Pollutant	Uncontrolled Emission Factor *(lb/SCC Units)*	Emission Factor Source (e.g. AP-42, Stack Test, Mass Balance)	Capture Efficiency *(%)*	Control Efficiency *(%)*	Hourly Emissions		Annual Emissions	
													Uncontrolled Potential (lb/hr)	Controlled Potential (lb/hr)	Uncontrolled Potential (tons/yr)	Controlled Potential (tons/yr)
D9	Tray Oven 1	D9	Tray Oven 1	NA		B-3	225 lb	PM/PM10	1.56 E-03	Stack Test	100%	0%	0.351	0.351	1.54	1.54
D11	Tray Oven 2	D11	Tray Oven 2	NA		B-3	225 lb	PM/PM10	1.56 E-03	Stack Test	100%	0%	0.351	0.351	1.54	1.54
D12	Tray Oven 3	D12	Tray Oven 3	NA		B-3	225 lb	PM/PM10	1.56 E-03	Stack Test	100%	0%	0.351	0.351	1.54	1.54
D13	Tray Oven 4	D13	Tray Oven 4	NA		B-3	225 lb	PM/PM10	1.56 E-03	Stack Test	100%	0%	0.351	0.351	1.54	1.54
D14	Tray Oven 5	D14	Tray Oven 5	NA		B-3	225 lb	PM/PM10	1.56 E-03	Stack Test	100%	0%	0.351	0.351	1.54	1.54

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007N

Source Emissions Profile

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__ Section N.2: Stack Information
__ Section N.3: Fugitive Information
__ Section N.4: Notes, Comments, and Explanations

Additional Documentation

___ Complete DEP7007AI

Source Name: Shamrock Technologies, Inc.

KY EIS (AFS) #: **21-** 101-00136

Permit #: F-16-012-R1

Agency Interest (AI) ID: 46709

Date: 12/4/2025

N.1: Emission Summary

Emission Unit #	Emission Unit Name	Process ID	Process Name	Control Device Name	Control Device ID	Stack ID	Maximum Design Capacity *(SCC Units/hour)*	Pollutant	Uncontrolled Emission Factor *(lb/SCC Units)*	Emission Factor Source (e.g. AP-42, Stack Test, Mass Balance)	Capture Efficiency *(%)*	Control Efficiency *(%)*	Hourly Emissions		Annual Emissions	
													Uncontrolled Potential *(lb/hr)*	Controlled Potential *(lb/hr)*	Uncontrolled Potential *(tons/yr)*	Controlled Potential *(tons/yr)*
D9	Tray Oven 1	D9	Tray Oven 1	NA		B-3	225 lb	VOC	1.96E-03	Stack Testing	100%	0%	0.44	1.93	0.44	1.93
D11	Tray Oven 2	D11	Tray Oven 2	NA		B-3	225 lb	VOC	1.96E-03	Stack Testing	100%	0%	0.44	1.93	0.44	1.93
D12	Tray Oven 3	D12	Tray Oven 3	NA		B-3	225 lb	VOC	1.96E-03	Stack Testing	100%	0%	0.44	1.93	0.44	1.93
D13	Tray Oven 4	D13	Tray Oven 4	NA		B-3	225 lb	VOC	1.96E-03	Stack Testing	100%	0%	0.44	1.93	0.44	1.93
D14	Tray Oven 5	D14	Tray Oven 5	NA		B-3	225 lb	VOC	1.96E-03	Stack Testing	100%	0%	0.44	1.93	0.44	1.93

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007N

Source Emissions Profile

__ Section N.1: Emission Summary
__ Section N.2: Stack Information
__ Section N.3: Fugitive Information
__ Section N.4: Notes, Comments, and Explanations

Additional Documentation

___ Complete DEP7007AI

Source Name: Shamrock Technologies, Inc.
KY EIS (AFS) #: **21-** 101-00136
Permit #: F-16-012-R1
Agency Interest (AI) ID: 46709
Date: 12/4/2025

N.1: Emission Summary

Emission Unit #	Emission Unit Name	Process ID	Process Name	Control Device Name	Control Device ID	Stack ID	Maximum Design Capacity *(SCC Units/hour)*	Pollutant	Uncontrolled Emission Factor *(lb/SCC Units)*	Emission Factor Source (e.g. AP-42, Stack Test, Mass Balance)	Capture Efficiency *(%)*	Control Efficiency *(%)*	Hourly Emissions		Annual Emissions	
													Uncontrolled Potential (lb/hr)	Controlled Potential *(lb/hr)*	Uncontrolled Potential *(tons/yr)*	Controlled Potential *(tons/yr)*
D9	Tray Oven 1	D9	Tray Oven 1	NA		B-3	225 lb	CO	5.95E-05	Stack Testing	100%	0%	0.01	0.01	0.06	0.06
D11	Tray Oven 2	D11	Tray Oven 2	NA		B-3	225 lb	CO	5.95E-05	Stack Testing	100%	0%	0.01	0.01	0.06	0.06
D12	Tray Oven 3	D12	Tray Oven 3	NA		B-3	225 lb	CO	5.95E-05	Stack Testing	100%	0%	0.01	0.01	0.06	0.06
D13	Tray Oven 4	D13	Tray Oven 4	NA		B-3	225 lb	CO	5.95E-05	Stack Testing	100%	0%	0.01	0.01	0.06	0.06
D14	Tray Oven 5	D14	Tray Oven 5	NA		B-3	225 lb	CO	5.95E-05	Stack Testing	100%	0%	0.01	0.01	0.06	0.06

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
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DEP7007N

Source Emissions Profile

__ Section N.1: Emission Summary
__ Section N.2: Stack Information
__ Section N.3: Fugitive Information
__ Section N.4: Notes, Comments, and Explanations

Additional Documentation

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Source Name: Shamrock Technologies, Inc.
KY EIS (AFS) #: **21-** 101-00136
Permit #: F-16-012-R1
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Date: 12/4/2025

N.1: Emission Summary

Emission Unit #	Emission Unit Name	Process ID	Process Name	Control Device Name	Control Device ID	Stack ID	Maximum Design Capacity *(SCC Units/hour)*	Pollutant	Uncontrolled Emission Factor *(lb/SCC Units)*	Emission Factor Source (e.g. AP-42, Stack Test, Mass Balance)	Capture Efficiency *(%)*	Control Efficiency *(%)*	Hourly Emissions		Annual Emissions	
													Uncontrolled Potential (lb/hr)	Controlled Potential *(lb/hr)*	Uncontrolled Potential *(tons/yr)*	Controlled Potential *(tons/yr)*
D9	Tray Oven 1	D9	Tray Oven 1	Scrubber 1	S1	B-3	225 lb	HF HAP	1.97E-03	Stack Test	100%	95%	0.44	1.93	0.022	0.1
D11	Tray Oven 2	D11	Tray Oven 2	Scrubber 1	S1	B-3	225 lb	HF HAP	1.97E-03	Stack Test	100%	95%	0.44	1.93	0.022	0.1
D12	Tray Oven 3	D12	Tray Oven 3	Scrubber 1	S1	B-3	225 lb	HF HAP	1.97E-03	Stack Test	100%	95%	0.44	1.93	0.022	0.1
D13	Tray Oven 4	D13	Tray Oven 4	Scrubber 1	S1	B-3	225 lb	HF HAP	1.97E-03	Stack Test	100%	95%	0.44	1.93	0.022	0.1
D14	Tray Oven 5	D14	Tray Oven 5	Scrubber 1	S1	B-3	225 lb	HF HAP	1.97E-03	Stack Test	100%	95%	0.44	1.93	0.022	0.1

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007N

Source Emissions Profile

__ Section N.1: Emission Summary
__ Section N.2: Stack Information
__ Section N.3: Fugitive Information
__ Section N.4: Notes, Comments, and Explanations

Additional Documentation

___ Complete DEP7007AI

Source Name: Shamrock Technologies, Inc.
KY EIS (AFS) #: **21-** 101-00136
Permit #: F-16-012-R1
Agency Interest (AI) ID: 46709
Date: 12/4/2025

N.1: Emission Summary

Emission Unit #	Emission Unit Name	Process ID	Process Name	Control Device Name	Control Device ID	Stack ID	Maximum Design Capacity *(SCC Units/hour)*	Pollutant	Uncontrolled Emission Factor *(lb/SCC Units)*	Emission Factor Source (e.g. AP-42, Stack Test, Mass Balance)	Capture Efficiency *(%)*	Control Efficiency *(%)*	Hourly Emissions		Annual Emissions	
													Uncontrolled Potential (lb/hr)	Controlled Potential *(lb/hr)*	Uncontrolled Potential *(tons/yr)*	Controlled Potential *(tons/yr)*
D9	Tray Oven 1	D9	Tray Oven 1	NA		B-3	225 lb	HCl HAP	2.75E-06	Stack Test	100%	0%	6.19E-04	6.19E-04	2.71E-03	2.71E-03
D11	Tray Oven 2	D11	Tray Oven 2	NA		B-3	225 lb	HCl HAP	2.75E-06	Stack Test	100%	0%	6.19E-04	6.19E-04	2.71E-03	2.71E-03
D12	Tray Oven 3	D12	Tray Oven 3	NA		B-3	225 lb	HCl HAP	2.75E-06	Stack Test	100%	0%	6.19E-04	6.19E-04	2.71E-03	2.71E-03
D13	Tray Oven 4	D13	Tray Oven 4	NA		B-3	225 lb	HCl HAP	2.75E-06	Stack Test	100%	0%	6.19E-04	6.19E-04	2.71E-03	2.71E-03
D14	Tray Oven 5	D14	Tray Oven 5	NA		B-3	225 lb	HCl HAP	2.75E-06	Stack Test	100%	0%	6.19E-04	6.19E-04	2.71E-03	2.71E-03

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007N

Source Emissions Profile

__ Section N.1: Emission Summary
__ Section N.2: Stack Information
__ Section N.3: Fugitive Information
__ Section N.4: Notes, Comments, and Explanations

Additional Documentation

___ Complete DEP7007AI

Source Name: Shamrock Technologies, Inc.

KY EIS (AFS) #: **21-** 101-00136

Permit #: F-16-012-R1

Agency Interest (AI) ID: 46709

Date: 12/4/2025

N.1: Emission Summary

Emission Unit #	Emission Unit Name	Process ID	Process Name	Control Device Name	Control Device ID	Stack ID	Maximum Design Capacity *(SCC Units/hour)*	Pollutant	Uncontrolled Emission Factor *(lb/SCC Units)*	Emission Factor Source (e.g. AP-42, Stack Test, Mass Balance)	Capture Efficiency *(%)*	Control Efficiency *(%)*	Hourly Emissions		Annual Emissions	
													Uncontrolled Potential (lb/hr)	Controlled Potential (lb/hr)	Uncontrolled Potential (tons/yr)	Controlled Potential (tons/yr)
D9	Tray Oven 1	D9	Tray Oven 1	NA		B-3	225 lb	CO2e	0.1953	Stack Testing	100%	0%	44	44	193	193
D11	Tray Oven 2	D11	Tray Oven 2	NA		B-3	225 lb	CO2e	0.1953	Stack Testing	100%	0%	44	44	193	193
D12	Tray Oven 3	D12	Tray Oven 3	NA		B-3	225 lb	CO2e	0.1953	Stack Testing	100%	0%	44	44	193	193
D13	Tray Oven 4	D13	Tray Oven 4	NA		B-3	225 lb	CO2e	0.1953	Stack Testing	100%	0%	44	44	193	193
D14	Tray Oven 5	D14	Tray Oven 5	NA		B-3	225 lb	CO2e	0.1953	Stack Testing	100%	0%	44	44	193	193

Section N.2: Stack Information

UTM Zone:

Stack ID	Identify all Emission Units (with Process ID) and Control Devices that Feed to Stack	Stack Physical Data			Stack UTM Coordinates		Stack Gas Stream Data		
		Equivalent Diameter *(ft)*	Height *(ft)*	Base Elevation *(ft)*	Northing *(m)*	Easting *(m)*	Flowrate *(acfm)*	Temperature *(° F)*	Exit Velocity *(ft/sec)*
B-3	Tray Ovens D9, D11, D12, D13 & D14	1	80	see modeling section	see modeling section	see modeling section	6556	68	139

Section N.3: Fugitive Information

UTM Zone:

Emission Unit #	Emission Unit Name	Process ID	Area Physical Data		Area UTM Coordinates		Area Release Data	
			Length of the X Side *(ft)*	Length of the Y Side *(ft)*	Northing *(m)*	Easting *(m)*	Release Temperature *(°F)*	Release Height *(ft)*
NA	NA	NA	NA	NA	NA	NA	NA	NA

Section N.4: Notes, Comments, and Explanations

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300 Sower Boulevard
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DEP7007V

Applicable Requirements and Compliance Activities

___ Section V.1: Emission and Operating Limitation(s)
___ Section V.2: Monitoring Requirements
___ Section V.3: Recordkeeping Requirements
___ Section V.4: Reporting Requirements
___ Section V.5: Testing Requirements
___ Section V.6: Notes, Comments, and Explanations

Additional Documentation

___ Complete DEP7007AI

Source Name: Shamrock Technologies, Inc.
KY EIS (AFS) #: 21- 101-00136
Permit #: F-16-012-R1
Agency Interest (AI) ID: 46709
Date: 12/4/2025

Section V.1: Emission and Operating Limitation(s)

Emission Unit #	Emission Unit Description	Applicable Regulation or Requirement	Pollutant	Emission Limit (if applicable)	Voluntary Emission Limit or Exemption (if applicable)	Operating Requirement or Limitation (if applicable)	Method of Determining Compliance with the Emission and Operating Requirement(s)

Refer to Attachment C

Section V.2: Monitoring Requirements

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Monitored	Description of Monitoring

Refer to Attachment C

Section V.3: Recordkeeping Requirements

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Recorded	Description of Recordkeeping

Refer to Attachment C

Section V.4: Reporting Requirements

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Reported	Description of Reporting

Refer to Attachment C

Section V.5: Testing Requirements

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Tested	Description of Testing

Refer to Attachment C

Section V.6: Notes, Comments, and Explanations

ATTACHMENT B PTE SUMMARIES

Shamrock Technologies, Inc.
Henderson, KY
Physical Potential to Emit

Pollutants	ICT E-Beam	E-Beam 3	Dynamitron E-Beam	Tray Ovens	Insignificant Activities	Total
	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year
PM/PM10	0.805	0.615	7.90E-04	7.69	0.88	9.99
Cobalt	-	-	1.70E-06	-	-	1.70E-06
VOC	23.93	37.40	17.72	9.66	4.60E-03	88.71
CO	1.63	1.90	0.64	0.29	0.072	4.53
NOx	0.52	-	-	-	0.086	0.61
SO2	0.0031	-	-	-	5.20E-04	0.004
HF HAP	1.00	1.39	0.65	0.49	-	3.52
HCl HAP	0.024	0.038	0.024	0.014	-	0.100
Formaldehyde HAP	0.017	0.027	0.14	-	-	0.18
Total HAP	1.04	1.46	0.81	0.50	-	3.81
CF4	0.83	1.30	0.38	0.13	-	2.64
Methane	0.16	0.24	0.83	0.17	1.96E-03	1.40
CO2	729	176	414	72	102	1,494
N2O	0.25	0.38	0.51	0.05	1.88E-03	1.20
CO2e	6,973	10,162	3,421	963	102	21,621

Shamrock Technologies, Inc.
Henderson, KY
Insignificant Activities

Pollutants	ACM 2	Mills	Dispersions	Spray Chiller	Total
	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
PM/PM10	5.20E-04	1.96E-01	2.04E-01	4.80E-01	8.81E-01
Cobalt	-	-	-	-	-
VOC	-	-	4.60E-03	-	4.60E-03
CO	-	-	7.20E-02	-	7.20E-02
NOx	-	-	8.60E-02	-	8.60E-02
SO2	-	-	5.20E-04	-	5.20E-04
HF HAP	-	-	-	-	-
HCl HAP	-	-	-	-	-
Formaldehyde HAP	-	-	-	-	-
CF4	-	-	-	-	-
Methane	-	-	1.96E-03	-	1.96E-03
CO2	-	-	102	-	102
N2O	-	-	1.88E-03	-	1.88E-03
CO2e	-	-	102	-	102

Shamrock Technologies, Inc.
Henderson, KY
Change in Potential Oven Emissions

Scenario	PM/PM10	VOC	CO	HF	HCl	GHG
Projected Oven Potential Emissions	7.69	9.66	0.293	0.485	0.014	963
Existing Oven Potential Emissions	1.37	1.60	0.052	0.114	0.002	188
Change in Project Emissions	6.32	8.06	0.241	0.372	0.011	775

Shamrock Technologies, Inc.
Henderson, KY
Maximum Average Tray Oven Emissions
(Worst Case Emissions are from High Dosed Materials)

Operations		Notes
Process	Tray Ovens	-
Emission Unit	Tray Ovens D9, D11, D12, D13 & D14	-
Stack ID	S-3	-
Maximum Hourly Process Rate per Unit for High Dosing	225 lb/hr	1
Number of Units	5 units	2
Hours of Operation	8760 hours	3

Uncontrolled Emissions

		Emission Rate Per Unit		Emission Rate for 5 Units		Notes
Pollutant	Emission Factor	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)	
PM/PM10	1.56E-03 lb/lb PTFE	0.35	1.54	1.76	7.69	4
VOC	1.96E-03 lb/lb PTFE	0.441	1.93	2.205	9.66	
CO	5.95E-05 lb/lb PTFE	0.013	0.06	0.067	0.29	
HF HAP	1.97E-03 lb/lb PTFE	0.443	1.94	2.217	9.71	
HCl HAP	2.75E-06 lb/lb PTFE	6.19E-04	2.71E-03	3.09E-03	0.014	
CO2e	-	43.95	192.51	219.76	962.54	5
CF4	2.67E-05 lb/lb PTFE	6.01E-03	2.63E-02	3.00E-02	0.13	4
Methane	3.37E-05 lb/lb PTFE	7.58E-03	3.32E-02	3.79E-02	0.17	
CO2	1.47E-02 lb/lb PTFE	3.31E+00	1.45E+01	1.65E+01	72.43	
N2O	1.01E-05 lb/lb PTFE	2.27E-03	9.95E-03	1.14E-02	0.05	

Controlled Emissions

			Emission Rate Per Unit		Emission Rate for 5 Units	
Pollutant	Emission Factor	Control Efficiency	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)
PM/PM10	1.56E-03 lb/lb PTFE	0%	0.351	1.54	1.755	7.69
VOC	1.96E-03 lb/lb PTFE	0%	0.441	1.93	2.205	9.66
CO	5.95E-05 lb/lb PTFE	0%	0.013	0.06	0.067	0.29
HF HAP	1.97E-03 lb/lb PTFE	95% [6]	0.022	0.10	0.111	0.49
HCl HAP	2.75E-06 lb/lb PTFE	0%	6.19E-04	2.71E-03	3.09E-03	1.36E-02
CO2e	-	0%	43.95	192.51	219.76	963
CF4	2.67E-05 lb/lb PTFE	0%	6.01E-03	2.63E-02	3.00E-02	0.13
Methane	3.37E-05 lb/lb PTFE	0%	7.58E-03	3.32E-02	3.79E-02	0.17
CO2	1.47E-02 lb/lb PTFE	0%	3.31E+00	1.45E+01	1.65E+01	72.43
N2O	1.01E-05 lb/lb PTFE	0%	2.27E-03	9.95E-03	1.14E-02	0.05

1 Maximum throughput based on maximum batch size of 3600 lb and the minimum batch time for high dose material of 16 ho
2 Emissions are based on a total of 5 tray ovens.
3 Emissions from tray ovens are based on 8760 hours.
4 Worst case emissions are from high dosing
5 CO2 equivalent calculated using global warming potentials (GWP) taken from 40 CFR 98 Subpart A Table A-1 (90 FR 21227, May 19, 2025).
6 A control efficiency of 95% is used based on test data collected on March 27, 2025 which averaged a scrubber HF control efficiency of 98.8% .

Shamrock Technologies, Inc.
Henderson, KY
Maximum HF Emissions

Process	Emission Unit	Emission Unit ID	Scrubber ID	Stack ID	Maximum Hourly Rate		Emission Factor		r of Units	Uncontrolled Emission Rate (lb/hr)	Efficiency	d Emission Rate (lb/hr)
ICT E-Beam	ICT Vault Exhaust	B1	-	B-1	80	kW-hr/unit	5.29E-05	lb/kW-hr	1	4.23E-03	0%	0.0042
	3 ICT Product Collector Filters	B3-3	Scrubber S3	B-8	80	kW-hr/unit	2.573E-02	lb/kW-hr	1	2.06	89.1%	0.2244
E-Beam 3	Vault Exhaust	B5	-	B-5	128	kW-hr/unit	2.98E-05	lb/kW-hr	1	3.81E-03	0%	0.0038
	4 Material Recovery Filters	B7-3	Scrubber S2	B-7	128	kW-hr/unit	3.26E-02	lb/kW-hr	1	4.17	92.5%	0.3131
Dynamitron E-Beam	Dynamitron North Vault Exhaust	D6-2		D-6	120	kW-hr/unit	5.46E-04	lb/kW-hr	1	0.065	0%	0.0655
	Dynamitron South Vault Exhaust	D7-2		D-7	120	kW-hr/unit	6.70E-04	lb/kW-hr	1	0.080	0%	0.0804
	Dynamitron Product Collector	D2-3, D10-3		D-2, D-10	120	kW-hr/unit	1.75E-05 [1]	lb/kW-hr	1	0.0021	0%	0.0021
Tray Oven	Tray Ovens	D9, D11, D12, D13, D14	Scrubber S1	B-3	300	lb PTFE/hr	1.97E-03 [2]	lb/lb PTFE	5	2.96	95% [3]	0.1478
Total										9.34		0.8412

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[1] The emission factor is reduced by a factor of 0.1228 because 14 out of 114 minutes is results in emissions of HF. The original emission factor was 1.421E-04 lb/kW-hr.

[2] Emission factor was derived from March 27, 2025 Stack test where the test run average of 2.66 lb/hr was multiplied by a maximum of 4 hours of emissions in a batch and divided by 5400 lb/batch during the test. The maximum 4 hours of emissions in a batch was derived from a measurement profile condicuted in 2009 on an oven. Historical data indicates that emissions follow a decay pattern where the maximum emission rate occurs at the begining of a bake phase. The emissions, if integrated over the batch cycle time can be released for 3.79 hours at the inital hourly emission rate.

[3] The engineering stack test of March 27, 2025 yielded a scrubber average HF control efficiency of 98.8%. An efficiency of 95% was used for for this evaluation.

Shamrock Technologies, Inc.
Henderson, KY
Tray Oven Emission Factor Development

Condition 2 - All ovens online during bake phase

Test Parameter	HF
Test Scenario	Condition 2
Test Date	28-Mar-25

Test Run	Ovens Operating	PTFE Processed (lb/batch)	Factor Derived from Continuous Oven HF Concentration Profile [1]	Uncontrolled HF Emission Rate (lb/hr)
1	#1, #2, #3	5,400		2.72
2	#1, #2, #3	5,400		2.57
3	#1, #2, #3	5,400		2.69
Average		5,400	400%	2.66

HF Emission Factor (lb/lb PTFE) 1.97E-03

[1] According to oven HF emissions concentrations profile during a batch cycle performed in 2009, a factor of 369% of the highest emission rate during the batch cycle represents emissions from the oven batch. This factor was rounded up to 400%.

VOC Emission Factor from 2018 (lb/lb PTFE)	HF Emission Factor from 2018 (lb/lb PTFE)	Correlated VOC Emission Factor from 2025 (lb/lb PTFE)
1.82E-03	1.83E-03	1.96E-03

Shamrock Technologies, Inc.
Henderson, KY
Maximum Anticipated Tray Oven Emissions
Tray Ovens Vented to Scrubber 1
(Worst Case Emissions are from High Dosed Materials)

Operations		Notes
Process	Tray Ovens	-
Emission Unit	Tray Ovens D9, D11, D12, D13 & D14	-
Stack ID	S-3	-
Maximum Hourly Process Rate per Unit for High Dosing	150 lb/hr	1
Number of Units	5 units	2
Hours of Operation	8760 hours	3

Uncontrolled Emissions

		Emission Rate Per Unit		Emission Rate for 5 Units		Notes
Pollutant	Emission Factor	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)	
PM/PM10	1.56E-03 lb/lb PTFE	0.23	1.02	1.17	5.12	4
VOC	1.96E-03 lb/lb PTFE	0.294	1.29	1.470	6.44	
CO	5.95E-05 lb/lb PTFE	0.009	0.04	0.045	0.20	
HF HAP	1.97E-03 lb/lb PTFE	0.296	1.29	1.478	6.47	
HCl HAP	2.75E-06 lb/lb PTFE	4.13E-04	1.81E-03	2.06E-03	0.009	
CO2e	-	29	128	147	642	5
CF4	2.67E-05 lb/lb PTFE	4.01E-03	1.75E-02	2.00E-02	0.09	4
Methane	3.37E-05 lb/lb PTFE	5.06E-03	2.21E-02	2.53E-02	0.11	
CO2	1.47E-02 lb/lb PTFE	2.21E+00	9.66E+00	1.10E+01	48.29	
N2O	1.01E-05 lb/lb PTFE	1.52E-03	6.64E-03	7.58E-03	0.03	

1 Maximum throughput based on maximum batch size of 3600 lb and the minimum batch time for high dose material.
2 Emissions are based on a total of 5 tray ovens.
3 Emissions from tray ovens are based on 8760 hours.
4 Worst case emissions are from high dosing
5 CO2 equivalent calculated using global warming potentials (GWP) taken from 40 CFR 98 Subpart A Table A-1 (90 FR 21227, May 19, 2025).

Controlled Emissions

			Emission Rate Per Unit		Emission Rate for 5 Units	
Pollutant	Emission Factor	Control Efficiency	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)
PM/PM10	1.56E-03 lb/process rate unit	0%	0.234	1.02	1.170	5.12
VOC	1.96E-03 lb/process rate unit	0%	0.294	1.29	1.470	6.44
CO	5.95E-05 lb/process rate unit	0%	0.009	0.04	0.045	0.20
HF HAP	1.97E-03 lb/process rate unit	95%	0.015	0.06	0.074	0.32
HCl HAP	2.75E-06 lb/process rate unit	0%	0.000	0.00	0.002	0.01
CO2e	-	0%	29.30	128.34	146.51	642
CF4	2.67E-05 lb/process rate unit	0%	4.01E-03	1.75E-02	2.00E-02	0.09
Methane	3.37E-05 lb/process rate unit	0%	5.06E-03	2.21E-02	2.53E-02	0.11
CO2	1.47E-02 lb/process rate unit	0%	2.21E+00	9.66E+00	1.10E+01	48
N2O	1.01E-05 lb/process rate unit	0%	1.52E-03	6.64E-03	7.58E-03	0.03

ATTACHMENT C SUGGESTED DRAFT PERMIT

Commonwealth of Kentucky
Energy and Environment Cabinet
Department for Environmental Protection
Division for Air Quality
300 Sower Boulevard, 2nd Floor
Frankfort, Kentucky 40601
(502) 564-3999

~~Final~~ Draft

AIR QUALITY PERMIT

Issued under 401 KAR 52:030

Permittee Name: Shamrock Technologies, Inc.
Mailing Address: 301 Community Drive, Henderson, KY 42420

Source Name: Shamrock Technologies, Inc.
Mailing Address: 301 Community Drive, Henderson, KY 42420

Source Location: 301 Community Drive

Permit ID: F-16-012 ~~R1~~R2
Agency Interest #: 46709
Activity ID: APE20180001
Review Type: Conditional Major, Construction / Operating
Source ID: 21-101-00136

Regional Office: Owensboro Regional Office
3032 Alvey Park Dr. W., Suite 700
Owensboro, KY 42303
(270) 687-7304
County: Henderson

Application Complete Date: January 26, 2016
Issuance Date: July 8, 2016
Revision 1 Date: May 3, 2018~~–~~
Revison 2 Date: XXX
Expiration Date: July 8, 2021

Michael Kennedy, Director
Division for Air Quality

Version 10/16/13

TABLE OF CONTENTS

	Permit type	Activity#	Complete Date	Issuance Date	Summary of Action
F-16-012	**Renewal**	**APE20150001 APE20160001**	**1/26/2016**	**7/8/2016**	**Addition of Tray Oven 2 (D11) and new scrubber**
F-16-012 R1	**Minor Revision**	**APE20180001**	**3/6/2018**	**5/3/2018**	**Addition of Tray Oven 3 (D12) and Tray Oven 4 (D13); Removal of Blender Oven 1 (E1)**
F-16-012 R2	**Minor Revision**	**APE20250001**	**X/X/XX**	**X/X/XX**	**Increase maximum hourly oven batch sizes to 3,600 lb/batch; Addition of Tray Oven 5 (D14)**

SECTION A - PERMIT AUTHORIZATION

Pursuant to a duly submitted application the Kentucky Energy and Environment Cabinet (Cabinet)) hereby authorizes the operation of the equipment described herein in accordance with the terms and conditions of this permit. This permit has been issued under the provisions of Kentucky Revised Statutes (KRS) Chapter 224 and regulations promulgated pursuant thereto.

The permittee shall not construct, reconstruct, or modify any affected facilities without first submitting a complete application and receiving a permit for the planned activity from the permitting authority, except as provided in this permit or in 401 KAR 52:030, Federally-enforceable permits for non-major sources.

Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits, licenses, or approvals required by the Cabinet or any other federal, state, or local agency.

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS

Emission Unit 01 (B3)	**ICT E-Beam Product Collectors**
Emission Unit 02 (D6)	**Dynamitron E-Beam N Vault**
Emission Unit 03 (D7)	**Dynamitron E-Beam S Vault**
Emission Unit 04 (D9)	**Tray Oven 1**
Emission Unit 06 (B7)	**E-Beam 3 Product Collectors**
~~**Emission Unit 07 (C11)**~~	~~**Two Heated Processing Units**~~
Emission Unit 08 (D11)	**Tray Oven 2**
Emission Unit 09 (D12)	**Tray Oven 3**
Emission Unit 10 (D13)	**Tray Oven 4**
Emission Unit 11 (D14)	**Tray Oven 5**

Table 1. Summary of the emission points, descriptions, and rated capacities

EMISSION UNIT	DESCRIPTION	MAXIMUM OPERATING RATE
B3	**ICT E-Beam Product Collectors** Three Baghouse Collectors (1) Particulate emissions due to baghouse exhaust flow and outlet grain loading; (2) VOC emissions due to processing PTFE with residual oils; and (3) Emissions due to irradiation. Installation Date: 1/1/1998 Production Rate: 400 lb/hr Control Device: Scrubber 3 Control Efficiency: 90% Control of HF Emissions	80 kwh
B7	**E-Beam 3 Product Collectors** Four Product Collectors (1) Particulate emissions due to baghouse exhaust flow and outlet grain loading; (2) VOC emissions due to processing PTFE with residual oils; and (3) Emissions due to irradiation. Installation Date: 6/1/2011 Production Rate: 560 lb/hr Control Device: Scrubber 2 Control Efficiency: 90% Control of HF Emissions	128 kwh

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

EMISSION UNIT	DESCRIPTION	MAXIMUM OPERATING RATE
D6	**Dynamitron E-Beam N Vault** Batch Process (1) VOC emissions due to processing PTFE with residual oils and (2) Emissions due to irradiation. Installation Date: 1/1/1999 Production Rate: 500 lb/hr Control Device: None	120 kwh
D7	**Dynamitron E-Beam S Vault** Batch Process (1) VOC emissions due to processing PTFE with residual oils and (2) Emissions due to irradiation. Installation Date: 1/1/1999 Production Rate: 500 lb/hr Control Device: None	120 kwh
D9	**Tray Oven 1** Tray Oven 1 Exhaust Installation Date: 1/1/2007 Control Device: Scrubber 1 Control Efficiency: ~~90~~Nominal 95% Control of HF	~~50~~ 225 lb/hr (high dose batch average)
~~C11~~	~~**Two Heated Processing Units (HPU-1 and HPU-2)**~~ ~~Heated Processing Units Exhaust~~ ~~Installation Date: 6/1/2013~~ ~~Control Device: None~~	~~80 lb/hr~~ ~~(each unit)~~
D11	**Tray Oven 2** Tray Oven 2 Exhaust Proposed Installation Date: After 2/1/2016 Control Device: Scrubber 1 Control Efficiency: ~~90~~Nominal 95% Control of HF	~~50~~ 225 lb/hr (high dose batch average)
D12	**Tray Oven 3** Tray Oven 3 Exhaust Proposed Installation Date: 3/15/2018 Control Device: Scrubber 1 Control Efficiency: ~~90~~Nominal 95% ~~Capture~~ Control of HF Emissions	~~50~~ 225 lb/hr (high dose batch average)
D13	**Tray Oven 4** Tray Oven 4 Exhaust Proposed Installation Date: 3/15/2018 Control Device: Scrubber 1 Control Efficiency: ~~90~~Nominal 95% ~~Capture~~ Control of HF Emissions	~~50~~ 225 lb/hr (high dose batch average)
D14	**Tray Oven 5** Tray Oven 5 Exhaust Proposed Installation Date: 3/2026 Control Device: Scrubber 1 Control Efficiency: Nominal 95% Control of HF Emissions	225 lb/hr (high dose batch average)

APPLICABLE REGULATIONS:

401 KAR 59:010, New Process Operations

401 KAR 53:010, Ambient Air Quality Standards

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

1. Operating Limitations:

None

2. Emission Limitations:

a. See **Section D.3, Source Emission Limitations** for HAP emission limitations.

b. The following emission limitation for particulate matter is pursuant to 401 KAR 59:010, Section 3 (2):

EMISSION POINT	**AFFECTED FACILITY**	**MAXIMUM CAPACITY (ton/hr)**	**MAXIMUM ALLOWABLE EMISSION RATE (lb/hr)**
B3	ICT E-Beam Product Collectors	0.20	2.34
B7	E-Beam 3 Product Collectors	0.28	2.34

Emission of particulate matter from a control device or stack of any affected facility up to a process rate of 1000 lb/hr shall not exceed **2.34** lb/hr and from 1000 lb/hr up to 60,000 lb/hr, the allowable emissions shall be calculated by the following equation:

$$E = 3.59(P)^{0.62}$$

E = the PM emissions rate (lb/hr)
P = the process rate (ton/hr)

c. 401 KAR 59:010, Section 3(1), no person shall cause, suffer, allow, or permit any continuous emission into the open air from a control device or stack associated with any affected facility which is equal to or greater than twenty (20) percent opacity.

d. Pursuant to 401 KAR 53:005, Section 1(3), the permittee shall not violate, or interfere with the attainment or maintenance of, ambient air quality standards as specified in 401 KAR 53:010.

***Compliance Demonstration Method*:**

1) See **Section D.3, Source Emission Limitations, Compliance Demonstration Method**.

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

2) Particulate Matter (PM) Mass Emission Standard:

EMISSION POINT	AFFECTED FACILITY	MAXIMUM ALLOWABLE EMISSION RATE (lb/hr)	MAXIMUM UNCONTROLLED EMISSION RATE (lb/hr)
B3	ICT E-Beam Product Collectors	2.34	0.171
B7	E-Beam 3 Product Collectors	2.34	0.129

3) For compliance with the opacity limit, refer to **4. Specific Monitoring Requirements** and **5. Specific Recordkeeping Requirements**.

4) The results of source-wide HF air dispersion modeling submitted on ~~March 2, 2018~~December XX, 2025 by the permittee demonstrates that source-wide potential to emit emission rates of controlled HF are in compliance with the primary and secondary standards for gaseous fluorides (expressed as HF) in Appendix A of 401 KAR 53:010. If the results from the performance test required by **3. Testing Requirements c.** show that the controlled HF emissions are greater than ~~4.4~~3.5 tpy, then the source shall submit the Air Quality Impact Assessment for HF to demonstrate compliance with 401 KAR 53:010.

3. Testing Requirements:

a. Within sixty (60) days after achieving the maximum production rate at which ~~D11~~ D14 (Tray Oven ~~2~~5) will be operated but no later than 180 days after initial start-up the permittee shall conduct a stack test to establish the appropriate HF emission factor which will be used to verify the ovens' controlled HF emission rate modeled to demonstrate compliance with the fluorides (as HF) ambient air quality standards in 401 KAR 53:010~~.~~

b. ~~The permittee shall also conduct performance tests on all scrubbers within 180 days after the final issuance of permit F-16-012 for the determination of the control efficiencies~~.

c. ~~Within sixty (60) days after achieving the maximum production rate at which D12 (Tray Oven 3) will be operated but no later than 180 days after initial startup, the permittee shall conduct a stack test to determine the control efficiency of Scrubber 1. Within sixty (60) days after achieving the maximum production rate at which D13 (Tray Oven 4) will be operated but no later than 180 days after initial startup, the permittee shall conduct a stack test to determine the control efficiency of Scrubber 1. A combined stack test may be conducted if the shorter of the deadlines for the demonstration of Scrubber 1 control efficiency is met by both ovens or the Division approves a revised schedule.~~ Refer to **Section G.4**, **Construction, Start-Up and Initial Compliance Demonstration Requirements** and **Section G.5**, **Testing Requirements**.

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

4. Specific Monitoring Requirements:

a. The following parameters shall be monitored:

Control Device	Emission Points	Stack	Parameter and Schedule
Scrubber 1	D9, D11, D12, D13 and ~~D13~~ D14	B-3	Semiannual inspection of all equipment
Scrubber 2	B7	B-7	Semiannual inspection of all equipment
Scrubber 3	B3	B-8	Semiannual inspection of all equipment

The permittee shall perform a qualitative visual observation of the opacity of emissions from Stacks B-3, B-7 and B-8 at least once per month. If visible emissions are seen, then an inspection of the scrubber shall be initiated and corrective action taken. If visible emissions are present after the corrective action, the process shall be shut down and shall not operate until repairs have been made that result in no visible emissions from the stack. In lieu of shutting the process down, the permittee may determine the opacity using Reference Method 9. If the opacity limit is not exceeded, the process may continue to operate [401 KAR 52:030, Section 10].

b. The permittee shall monitor and record daily the flowrate of the effluent liquid from each scrubber.

5. Specific Recordkeeping Requirements:

a. A log of the results of the semiannual inspections performed on stacks B-3, B-7 and B-8 shall be maintained.

b. The permittee shall maintain a log of the dates and times of each qualitative visual observation: noting color, duration, density (dark or light), and cause.

c. The permittee shall maintain a log of the dates and times of each EPA Reference Method 9 test and either the results of the test, or reasons for not performing an EPA Reference Method 9 test.

d. The permittee shall keep records of the air dispersion modeling of controlled HF emissions.

e. A log of the results of the daily inspections performed on each scrubber shall be maintained.

f. Refer to **Section F**.

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

6. Specific Reporting Requirements:

Refer to **Section F.9.** for Compliance Certification Requirements.

7. Specific Control Equipment Operating Conditions:

Refer to **Section E, Source Control Equipment Requirements,** for further specific control equipment operating conditions. Refer to **Section D.3.b**.

SECTION C - INSIGNIFICANT ACTIVITIES

The following listed activities have been determined to be insignificant activities for this source pursuant to 401 KAR 52:030, Section 6. Although these activities are designated as insignificant the permittee must comply with the applicable regulation. Process and emission control equipment at each insignificant activity subject to an opacity standard shall be inspected monthly and a qualitative visible emissions evaluation made. Results of the inspection, evaluation, and any corrective action shall be recorded in a log.

	Description	Generally Applicable Regulations
(1)	B1 (ICT vault exhaust – ambient air only)	None
(2)	B2 (ICT window exhaust – ambient air only)	None
(3)	B4 (ICT process heater – 1.2 mmBtu/hr natural gas fired indirect heat exchanger)	401 KAR 59:015
(4)	D2 (Three Dynamitron product collectors – rated at 509 lb/hr)	401 KAR 59:010
(5)	E2 (ACM 1 Grinder product collector – rated at 200 lb/hr)	401 KAR 59:010
(6)	E3 (ACM 2 Grinder product collector – rated at 300 lb/hr)	401 KAR 59:010
(7)	E4 (Three Tray Oven vacuum product collectors – rated at 50 lb/hr per oven)	401 KAR 59:010
(8)	D1 (Mill 1 (White Mill) and product collector – rated at 500 lb/hr)	401 KAR 59:010
(9)	D4 (Mill 1 product collector baghouse – rated at 500 lb/hr)	401 KAR 59:010
(10)	D5 (Mill 2 (Gray Mill) and product collector – rated at 500 lb/hr)	401 KAR 59:010
(11)	D8 (Mill 2 product collector baghouse – rated at 500 lb/hr)	401 KAR 59:010
(12)	D3 (Mill 3 product collector baghouse – rated at 54 lb/hr)	401 KAR 59:010
(13)	C1 (Mill 6 product collector baghouse – rated at 40 lb/hr)	401 KAR 59:010
(14)	C5 (Mill 7 product collector baghouse – rated at 40 lb/hr)	401 KAR 59:010
(15)	C6 (Mills 6 and 7 Common Dust Collector)	401 KAR 59:010
(16)	C3 (Dispersions 1 process separator baghouse – rated at 500 lb/hr)	401 KAR 59:010

SECTION C - INSIGNIFICANT ACTIVITIES (CONTINUED)

Description	**Generally Applicable Regulations**
(17) C7 (Dispersions 1 oil heater – 99,000 Btu/hr natural gas fired indirect heat exchanger)	None
(18) C2 (Dispersions 2 process separator baghouse – rated at 500 lb/hr)	401 KAR 59:010
(19) C8 (Dispersions 2 oil heater – 99,000 Btu/hr natural gas fired indirect heat exchanger)	None
(20) A1 (Spray chiller product collector baghouse – rated at 110 lb/hr)	401 KAR 59:010
(21) Storage vessels having less than 10,567 gallons capacity that contain petroleum or organic liquids with a vapor pressure of 1.5 psia or less at storage temperature	None
(22) Storage vessels having less than 10,567 gallons capacity that contain petroleum or organic liquids with a vapor pressure greater than 1.5 psia at storage temperature, providing those vessels having more than 580 gallons capacity are equipped with a permanent submerged fill pipe	None
(23) Storage vessels containing inorganic aqueous liquids, except inorganic acids with boiling points below the maximum storage temperature at atmospheric pressure	None
(24) Laboratory fume hoods and vents used exclusively for chemical or physical analysis, or for “bench-scale production” research and development facilities	None
(25) Machinery lubricants and waxes, including oils, greases or other lubricants applied as temporary protective coatings	None
(26) C9 (Mill 8 and product collector baghouse – rated at 200 lb/hr)	401 KAR 59:010
(27) C10 (Mill 9 and product collector baghouse – rated at 200 lb/hr)	401 KAR 59:010
(28) D10 (Second Set of Three Dynamitron product collectors – rated at 509 lb/hr)	401 KAR 59:010
(29) B5 (E-Beam 3 vault exhaust – ambient air only)	None

SECTION C - INSIGNIFICANT ACTIVITIES (CONTINUED)

Description	**Generally Applicable Regulations**
(30) B6 (E-Beam 3 window exhaust – ambient air only)	None
(31) C12 (Mill 10 and product collector baghouse – rated at 250 lb/hr	401 KAR 59:010

SECTION D - SOURCE EMISSION LIMITATIONS AND TESTING REQUIREMENTS

1. As required by Section 1b of the *Cabinet Provisions and Procedures for Issuing Federally-Enforceable Permits for Non-Major Sources* incorporated by reference in 401 KAR 52:030, Section 26; compliance with annual emissions and processing limitations contained in this permit, shall be based on emissions and processing rates for any twelve (12) consecutive months.

2. Hazardous air pollutant (HAP) emissions, measured by applicable reference methods, or an equivalent or alternative method specified in 40 C.F.R. Chapter I, or by a test method specified in the state implementation plan shall not exceed the respective limitations specified herein.

3. **Source Emission Limitations:**
To preclude the applicability of 401 KAR 52:020, *Title V permits*, the total annual source-wide HAP emissions shall not exceed 9 tons per year of each individual HAP and 22.5 tons per year of combined HAPs on a twelve (12) consecutive month basis.

Compliance Demonstration Method:

a. Compliance shall be determined by calculating and recording monthly emission rates and rolling 12-month total emissions of each individual HAP and total HAPs.

b. Actual emission rate for HF is calculated using the following equation:

Monthly Emission Rate = [Monthly Processing Rate x HF Emission Factor x (1 – efficiency of the scrubber determined from the most recent performance test)]

c. In place of actual emission rates for HF, the permittee may use worst-case emission rates for HF using the following equation:

Monthly Emission Rate = [Monthly Processing Rate x HF Emission Factor x (1 – manufacturer guarantee efficiency of the scrubber until testing is completed)]

d. Compliance shall be achieved when the scrubbers are operating and properly maintained according to manufacturer's specifications.

e. A report of the consecutive twelve (12) month totals of HAP emissions for each HAP and combined HAPs from all emission points in **Sections B** and **C** of the permit shall be maintained onsite. Refer to **Sections F.5**, **F.7** and **F.8**.

SECTION E - SOURCE CONTROL EQUIPMENT REQUIREMENTS

Pursuant to 401 KAR 50:055, Section 2(5), at all times, including periods of startup, shutdown and malfunction, owners and operators shall, to the extent practicable, maintain and operate any affected facility including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Division which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source.

SECTION F - MONITORING, RECORDKEEPING, AND REPORTING REQUIREMENTS

1. Pursuant to Section 1b-IV-1 of the *Cabinet Provisions and Procedures for Issuing Federally-Enforceable Permits for Non-Major Sources* incorporated by reference in 401 KAR 52:030 Section 26, when continuing compliance is demonstrated by periodic testing or instrumental monitoring, the permittee shall compile records of required monitoring information that include:

   a. Date, place (as defined in this permit), and time of sampling or measurements;
   b. Analyses performance dates;
   c. Company or entity that performed analyses;
   d. Analytical techniques or methods used;
   e. Analyses results; and
   f. Operating conditions during time of sampling or measurement.

2. Records of all required monitoring data and support information, including calibrations, maintenance records, and original strip chart recordings, and copies of all reports required by the Division for Air Quality, shall be retained by the permittee for a period of five (5) years and shall be made available for inspection upon request by any duly authorized representative of the Division for Air Quality [401 KAR 52:030, Section 3(1)(f)1a, and Section 1a-7 of the *Cabinet Provisions and Procedures for Issuing Federally-Enforceable Permits for Non-Major Sources* incorporated by reference in 401 KAR 52:030, Section 26].

3. In accordance with the requirements of 401 KAR 52:030, Section 3(1)f, the permittee shall allow authorized representatives of the Cabinet to perform the following during reasonable times:

   a. Enter upon the premises to inspect any facility, equipment (including air pollution control equipment), practice, or operation;
   b. To access and copy any records required by the permit;
   c. Sample or monitor, at reasonable times, substances or parameters to assure compliance with the permit or any applicable requirements.

   Reasonable times are defined as during all hours of operation, during normal office hours; or during an emergency.

4. No person shall obstruct, hamper, or interfere with any Cabinet employee or authorized representative while in the process of carrying out official duties. Refusal of entry or access may constitute grounds for permit revocation and assessment of civil penalties.

5. Summary reports of any monitoring required by this permit shall be submitted to the Regional Office listed on the front of this permit at least every six (6) months during the life of this permit, unless otherwise stated in this permit. For emission units that were still under construction or which had not commenced operation at the end of the 6-month period covered by the report and are subject to monitoring requirements in this permit, the report shall indicate that no monitoring was performed during the previous six months because the emission unit was not in operation [Sections 1b-V-1 of the *Cabinet Provisions and Procedures for Issuing Federally-Enforceable Permits for Non-Major Sources* incorporated by reference in 401 KAR 52:030, Section 26].

SECTION F - MONITORING, RECORDKEEPING, AND REPORTING REQUIREMENTS (CONTINUED)

6. The semi-annual reports are due by January 30th and July 30th of each year. All reports shall be certified by a responsible official pursuant to 401 KAR 52:030, Section 22. If continuous emission and opacity monitors are required by regulation or this permit, data shall be reported in accordance with the requirements of 401 KAR 59:005, General Provisions, Section 3(3). All deviations from permit requirements shall be clearly identified in the reports.

7. In accordance with the provisions of 401 KAR 50:055, Section 1, the owner or operator shall notify the Regional Office listed on the front of this permit concerning startups, shutdowns, or malfunctions as follows:
   a. When emissions during any planned shutdowns and ensuing startups will exceed the standards, notification shall be made no later than three (3) days before the planned shutdown, or immediately following the decision to shut down, if the shutdown is due to events which could not have been foreseen three (3) days before the shutdown.
   b. When emissions due to malfunctions, unplanned shutdowns and ensuing startups are or may be in excess of the standards, notification shall be made as promptly as possible by telephone (or other electronic media) and shall be submitted in writing upon request.

8. The permittee shall promptly report deviations from permit requirements, including those attributable to upset conditions as defined in the permit, the probable cause of such deviations, and any corrective actions or preventive measures taken shall be submitted to the Regional Office listed on the front of this permit. Where the underlying applicable requirement contains a definition of prompt or otherwise specifies a time frame for reporting deviations, that definition or time frame shall govern. Where the underlying applicable requirement does not identify a specific time frame for reporting deviations, prompt reporting, as required by Sections 1b-V, 3 and 4 of the *Cabinet Provisions and Procedures for Issuing Federally-Enforceable Permits for Non-Major Sources* incorporated by reference in 401 KAR 52:030, Section 26 shall be defined as follows:
   a. For emissions of a hazardous air pollutant or a toxic air pollutant (as identified in an applicable regulation) that continue for more than an hour in excess of permit requirements, the report must be made within 24 hours of the occurrence.
   b. For emissions of any regulated air pollutant, excluding those listed in F.8.a., that continue for more than two hours in excess of permit requirements, the report must be made within 48 hours.
   c. All deviations from permit requirements, including those previously reported, shall be included in the semiannual report required by F.6.

9. Pursuant to 401 KAR 52:030, Section 21, the permittee shall annually certify compliance with the terms and conditions contained in this permit by completing and returning a Compliance Certification Form (DEP 7007CC) (or an alternative approved by the regional office) to the Regional Office listed on the front of this permit in accordance with the following requirements:
   a. Identification of each term or condition;
   b. Compliance status of each term or condition of the permit;
   c. Whether compliance was continuous or intermittent;
   d. The method used for determining the compliance status for the source, currently and over the reporting period.

SECTION F - MONITORING, RECORDKEEPING, AND REPORTING REQUIREMENTS (CONTINUED)

e. For an emissions unit that was still under construction or which has not commenced operation at the end of the 12-month period covered by the annual compliance certification, the permittee shall indicate that the unit is under construction and that compliance with any applicable requirements will be demonstrated within the timeframes specified in the permit.

f. The certification shall be submitted by January 30th of each year. Annual compliance certifications shall be sent to the following address:

Division for Air Quality
Owensboro Regional Office
3032 Alvey Park Drive W., Suite 700
Owensboro, KY 42303-2191

10. In accordance with 401KAR 52:030, Section 3(1)(d), the permittee shall provide the Division with all information necessary to determine its subject emissions within 30 days of the date the Kentucky Emissions Inventory System (KYEIS) emissions survey is mailed to the permittee. If a KYEIS emissions survey is not mailed to the permittee, then the permittee shall comply with all other emissions reporting requirements in this permit.

11. The Cabinet may authorize the temporary use of an emission unit to replace a similar unit that is taken off-line for maintenance, if the following conditions are met:
    a. The owner or operator shall submit to the Cabinet, at least ten (10) days in advance of replacing a unit, the appropriate Forms DEP7007AI to DD that show:
        1) The size and location of both the original and replacement units; and
        2) Any resulting change in emissions;
    b. The potential to emit (PTE) of the replacement unit shall not exceed that of the original unit by more than twenty-five (25) percent of a major source threshold, and the emissions from the unit shall not cause the source to exceed the emissions allowable under the permit;
    c. The PTE of the replacement unit or the resulting PTE of the source shall not subject the source to a new applicable requirement;
    d. The replacement unit shall comply with all applicable requirements; and
    e. The source shall notify Regional office of all shutdowns and start-ups.
    f. Within six (6) months after installing the replacement unit, the owner or operator shall:
        1) Re-install the original unit and remove or dismantle the replacement unit; or
        2) Submit an application to permit the replacement unit as a permanent change.

SECTION G - GENERAL PROVISIONS

1. General Compliance Requirements

a. The permittee shall comply with all conditions of this permit. A noncompliance shall be a violation of 401 KAR 52:030, Section 3(1)(b), and a violation of Federal Statute 42 USC 7401 through 7671q (the Clean Air Act). Noncompliance with this permit is grounds for enforcement action including but not limited to the termination, revocation and reissuance, revision, or denial of a permit [Section 1a-2 of the *Cabinet Provisions and Procedures for Issuing Federally-Enforceable Permits for Non-Major Sources* incorporated by reference in 401 KAR 52:030, Section 26].

b. The filing of a request by the permittee for any permit revision, revocation, reissuance, or termination, or of a notification of a planned change or anticipated noncompliance, shall not stay any permit condition [Section 1a-5 of the *Cabinet Provisions and Procedures for Issuing Federally-Enforceable Permits for Non-Major Sources* incorporated by reference in 401 KAR 52:030, Section 26].

c. This permit may be revised, revoked, reopened and reissued, or terminated for cause in accordance with 401 KAR 52:030, Section 18. The permit will be reopened for cause and revised accordingly under the following circumstances:

1) If additional applicable requirements become applicable to the source and the remaining permit term is three (3) years or longer. In this case, the reopening shall be completed no later than eighteen (18) months after promulgation of the applicable requirement. A reopening shall not be required if compliance with the applicable requirement is not required until after the date on which the permit is due to expire, unless this permit or any of its terms and conditions have been extended pursuant to 401 KAR 52:030, Section 12;
2) The Cabinet or the United States Environmental Protection Agency (U. S. EPA) determines that the permit must be revised or revoked to assure compliance with the applicable requirements;
3) The Cabinet or the U. S. EPA determines that the permit contains a material mistake or that inaccurate statements were made in establishing the emissions standards or other terms or conditions of the permit.

Proceedings to reopen and reissue a permit shall follow the same procedures as apply to initial permit issuance and shall affect only those parts of the permit for which cause to reopen exists. Reopenings shall be made as expeditiously as practicable. Reopenings shall not be initiated before a notice of intent to reopen is provided to the source by the Division, at least thirty (30) days in advance of the date the permit is to be reopened, except that the Division may provide a shorter time period in the case of an emergency.

d. The permittee shall furnish information upon request of the Cabinet to determine if cause exists for modifying, revoking and reissuing, or terminating the permit; or to determine compliance with the conditions of this permit [Sections 1a- 6 and 7 of the *Cabinet Provisions and Procedures for Issuing Federally-Enforceable Permits for Non-Major Sources* incorporated by reference in 401 KAR 52:030, Section 26].

e. Emission units described in this permit shall demonstrate compliance with applicable requirements if requested by the Division [401 KAR 52:030, Section 3(1)(c)].

SECTION G - GENERAL PROVISIONS (CONTINUED)

f. The permittee, upon becoming aware that any relevant facts were omitted or incorrect information was submitted in the permit application, shall promptly submit such supplementary facts or corrected information to the permitting authority [401 KAR 52:030, Section 7(1)].

g. Any condition or portion of this permit which becomes suspended or is ruled invalid as a result of any legal or other action shall not invalidate any other portion or condition of this permit [Section 1a-11 of the *Cabinet Provisions and Procedures for Issuing Federally-Enforceable Permits for Non-Major Sources* incorporated by reference in 401 KAR 52:030, Section 26].

h. The permittee shall not use as a defense in an enforcement action the contention that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance [Section 1a-3 of the *Cabinet Provisions and Procedures for Issuing Federally-Enforceable Permits for Non-Major Sources* incorporated by reference in 401 KAR 52:030, Section 26].

i. All emission limitations and standards contained in this permit shall be enforceable as a practical matter. All emission limitations and standards contained in this permit are enforceable by the U.S. EPA and citizens except for those specifically identified in this permit as state-origin requirements. [Section 1a-12 of the Cabinet Provisions and Procedures for Issuing Federally-Enforceable Permits for Non-Major Sources incorporated by reference in 401 KAR 52:030, Section 26].

j. This permit shall be subject to suspension if the permittee fails to pay all emissions fees within 90 days after the date of notice as specified in 401 KAR 50:038, Section 3(6) [Section 1a-9 of the *Cabinet Provisions and Procedures for Issuing Federally-Enforceable Permits for Non-Major Sources* incorporated by reference in 401 KAR 52:030, Section 26].

k. Nothing in this permit shall alter or affect the liability of the permittee for any violation of applicable requirements prior to or at the time of permit issuance [401 KAR 52:030, Section 11(3)].

l. This permit does not convey property rights or exclusive privileges [Section 1a-8 of the *Cabinet Provisions and Procedures for Issuing Federally-Enforceable Permits for Non-Major Sources* incorporated by reference in 401 KAR 52:030, Section 26].

m. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits, licenses, or approvals required by the Cabinet or any other federal, state, or local agency.

n. Nothing in this permit shall alter or affect the authority of U.S. EPA to obtain information pursuant to Federal Statute 42 USC 7414, Inspections, monitoring, and entry.

o. Nothing in this permit shall alter or affect the authority of U.S. EPA to impose emergency orders pursuant to Federal Statute 42 USC 7603, Emergency orders.

SECTION G - GENERAL PROVISIONS (CONTINUED)

p. This permit consolidates the authority of any previously issued PSD, NSR, or Synthetic Minor source preconstruction permit terms and conditions for various emission units and incorporates all requirements of those existing permits into one single permit for this source.

q. Pursuant to 401 KAR 52:030, Section 11, a permit shield shall not protect the owner or operator from enforcement actions for violating an applicable requirement prior to or at the time of permit issuance. Compliance with the conditions of this permit shall be considered compliance with:
   1) Applicable requirements that are included and specifically identified in this permit; and
   2) Non-applicable requirements expressly identified in this permit.

2. Permit Expiration and Reapplication Requirements

a. This permit shall remain in effect for a fixed term of five (5) years following the original date of issue. Permit expiration shall terminate the source's right to operate unless a timely and complete renewal application has been submitted to the Division at least six (6) months prior to the expiration date of the permit. Upon a timely and complete submittal, the authorization to operate within the terms and conditions of this permit, including any permit shield, shall remain in effect beyond the expiration date, until the renewal permit is issued or denied by the Division [401 KAR 52:030, Section 12].

b. The authority to operate granted through this permit shall cease to apply if the source fails to submit additional information requested by the Division after the completeness determination has been made on any application, by whatever deadline the Division sets [401 KAR 52:030, Section 8(2)].

3. Permit Revisions

a. Minor permit revision procedures specified in 401 KAR 52:030, Section 14(3), may be used for permit revisions involving the use of economic incentive, marketable permit, emission trading, and other similar approaches, to the extent that these minor permit revision procedures are explicitly provided for in the State Implementation Plan (SIP) or in applicable requirements and meet the relevant requirements of 401 KAR 52:030, Section 14(2).

b. This permit is not transferable by the permittee. Future owners and operators shall obtain a new permit from the Division for Air Quality. The new permit may be processed as an administrative amendment if no other change in this permit is necessary, and provided that a written agreement containing a specific date for transfer of permit responsibility coverage and liability between the current and new permittee has been submitted to the permitting authority within ten (10) days following the transfer.

SECTION G - GENERAL PROVISIONS (CONTINUED)

4. Construction, Start-Up, and Initial Compliance Demonstration Requirements

Pursuant to a duly submitted application the Kentucky Division for Air Quality hereby authorizes the construction of the equipment described herein, emission unit ~~**D12 (Tray Oven 3) and D13 (Tray Oven 4)**~~**D14 (Tray Oven 5)** in accordance with the terms and conditions of permit F- 16-012 ~~R1~~R2.

a. Construction of any process and/or air pollution control equipment authorized by permit F-16-012 ~~R1~~ R2 shall be conducted and completed only in compliance with the conditions of permit F-16-012 ~~R1~~R2.

b. Within thirty (30) days following commencement of construction and within fifteen (15) days following start-up and attainment of the maximum production rate specified in the permit application, or within fifteen (15) days following the issuance date of permit F-16-012 ~~R1~~R2, whichever is later, the permittee shall furnish to the Regional Office listed on the front of permit F-16-012 ~~R1~~ R2 in writing, with a copy to the Division's Frankfort Central Office, notification of the following:
   1) The date when construction commenced.
   2) The date of start-up of the affected facilities listed in permit F-16-012 ~~R1~~R2.
   3) The date when the maximum production rate specified in the permit application was achieved.

c. Pursuant to 401 KAR 52:030, Section 3(2), unless construction is commenced within eighteen (18) months after the permit is issued, or begins but is discontinued for a period of eighteen (18) months or is not completed within a reasonable timeframe then the construction and operating authority granted by permit F-16-012 ~~R1~~ R2 for those affected facilities for which construction was not completed shall immediately become invalid. Upon written request, the Cabinet may extend these time periods if the source shows good cause.

d. For those affected facilities for which construction is authorized by permit F-16-012 ~~R1~~R2, a source shall be allowed to construct upon application deemed complete. Pursuant to 401 KAR 50:055, Section 2(1)(a), an owner or operator of any affected facility subject to any standard within the administrative regulations of the Division for Air Quality shall demonstrate compliance with the applicable standard(s) within sixty (60) days after achieving the maximum production rate at which the affected facility will be operated, but not later than 180 days after initial start-up of such facility. Pursuant to 401 KAR 52:030, Section 3(3)(c), sources that have not demonstrated compliance within the timeframes prescribed in 401 KAR 50:055, Section 2(1)(a), shall operate the affected facility only for purposes of demonstrating compliance unless authorized under an approved compliance plan or an order of the cabinet.

e. Permit F-16-012 ~~R1~~ R2 shall allow time for the initial start-up, operation, and compliance demonstration of the affected facilities listed herein. However, within sixty (60) days after achieving the maximum production rate at which the affected facilities will be operated but not later than 180 days after initial start-up of such facilities, the permittee shall conduct a performance demonstration on the affected facilities in accordance with 401 KAR 50:055, General compliance requirements. Testing must also be conducted in accordance with General Provisions G.5 of permit F-16-012 ~~R1~~R2.

SECTION G - GENERAL PROVISIONS (CONTINUED)

5. Testing Requirements

   a. Pursuant to 401 KAR 50:045, Section 2, a source required to conduct a performance test shall submit a completed Compliance Test Protocol form, DEP form 6028, or a test protocol a source has developed for submission to other regulatory agencies, in a format approved by the cabinet, to the Division's Frankfort Central Office a minimum of sixty (60) days prior to the scheduled test date. Pursuant to 401 KAR 50:045, Section 7, the Division shall be notified of the actual test date at least Thirty (30) days prior to the test.

   b. Pursuant to 401 KAR 50:045, Section 5, in order to demonstrate that a source is capable of complying with a standard at all times, any required performance test shall be conducted under normal conditions that are representative of the source's operations and create the highest rate of emissions. If [When] the maximum production rate represents a source's highest emissions rate and a performance test is conducted at less than the maximum production rate, a source shall be limited to a production rate of no greater than 110 percent of the average production rate during the performance tests. If and when the facility is capable of operation at the rate specified in the application, the source may retest to demonstrate compliance at the new production rate. The Division for Air Quality may waive these requirements on a case-by-case basis if the source demonstrates to the Division's satisfaction that the source is in compliance with all applicable requirements.

   c. Results of performance test(s) required by the permit shall be submitted to the Division by the source or its representative within forty-five days or sooner if required by an applicable standard, after the completion of the fieldwork.

6. Acid Rain Program Requirements

   If an applicable requirement of Federal Statute 42 USC 7401 through 7671q (the Clean Air Act) is more stringent than an applicable requirement promulgated pursuant to Federal Statute 42 USC 7651 through 7651o (Title IV of the Act), both provisions shall apply, and both shall be state and federally enforceable.

7. Emergency Provisions

   a. Pursuant to 401 KAR 52:030, Section 23(1), an emergency shall constitute an affirmative defense to an action brought for noncompliance with the technology-based emission limitations if the permittee demonstrates through properly signed contemporaneous operating logs or other relevant evidence that:
      1) An emergency occurred and the permittee can identify the cause of the emergency;
      2) The permitted facility was at the time being properly operated;
      3) During an emergency, the permittee took all reasonable steps to minimize levels of emissions that exceeded the emissions standards or other requirements in the permit; and,
      4) The permittee notified the Division as promptly as possible and submitted written notice of the emergency to the Division within two (2) working days of the time when emission limitations were exceeded due to an emergency. The notice shall include a description of the emergency, steps taken to mitigate emissions, and the corrective

actions taken.

5) Notification of the Division does not relieve the source of any other local, state or federal notification requirements.

b. Emergency conditions listed in General Provision G.7.a above are in addition to any emergency or upset provision(s) contained in an applicable requirement [401 KAR 52:030, Section 23(3)].

c. In an enforcement proceeding, the permittee seeking to establish the occurrence of an emergency shall have the burden of proof [401 KAR 52:030, Section 23(2)].

8. Ozone depleting substances

a. The permittee shall comply with the standards for recycling and emissions reduction pursuant to 40 CFR 82, Subpart F, except as provided for Motor Vehicle Air Conditioners (MVACs) in Subpart B:
   1) Persons opening appliances for maintenance, service, repair, or disposal shall comply with the required practices contained in 40 CFR 82.156.
   2) Equipment used during the maintenance, service, repair, or disposal of appliances shall comply with the standards for recycling and recovery equipment contained in 40 CFR 82.158.
   3) Persons performing maintenance, service, repair, or disposal of appliances shall be certified by an approved technician certification program pursuant to 40 CFR 82.161.
   4) Persons disposing of small appliances, MVACs, and MVAC-like appliances (as defined at 40 CFR 82.152) shall comply with the recordkeeping requirements pursuant to 40 CFR 82.166.
   5) Persons owning commercial or industrial process refrigeration equipment shall comply with the leak repair requirements pursuant to 40 CFR 82.156.
   6) Owners/operators of appliances normally containing 50 or more pounds of refrigerant shall keep records of refrigerant purchased and added to such appliances pursuant to 40 CFR 82.166.

b. If the permittee performs service on motor (fleet) vehicle air conditioners containing ozone-depleting substances, the source shall comply with all applicable requirements as specified in 40 CFR 82, Subpart B, *Servicing of Motor Vehicle Air Conditioners*.

9. Risk Management Provisions

a. The permittee shall comply with all applicable requirements of 401 KAR Chapter 68, Chemical Accident Prevention, which incorporates by reference 40 CFR Part 68, Risk Management Plan provisions. If required, the permittee shall comply with the Risk Management Program and submit a Risk Management Plan to:

RMP Reporting Center
P.O. Box 1515
Lanham-Seabrook, MD 20703-1515.

b. If requested, submit additional relevant information to the Division or the U.S. EPA.

SECTION H - ALTERNATE OPERATING SCENARIOS

None

SECTION I - COMPLIANCE SCHEDULE

None

ATTACHMENT D AIR QUALITY ASSESSMENT

Modeling Report

Shamrock Technologies, Inc.
Henderson, KY

PREPARED FOR
Shamrock Technologies, Inc.

DATE
4 December 2025

REFERENCE
0656051

TITLE PAGE

Modeling Report

Shamrock Technologies, Inc.

0656051

Environmental Resources Management, Inc.
901 Woodland
Suite 104
Nashville, Tennessee 37206

Phone: +1 615 656 7100

CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. AIR QUALITY AND OTHER ENVIRONMENTAL IMPACTS

The purpose of this assessment is to evaluate the ambient air quality impact of cumulative Hydrogen Fluoride (HF) emissions from the proposed project at the Shamrock facility. This project increases the oven batch size to 3,600 pounds and adds an additional oven to the site for a total of five. The total of five tray ovens will vent to the existing tray oven scrubber (Scrubber S1). The Scrubber S1 control efficiency was increased from 92.9% to 95%. This project is required to demonstrate air quality impacts for fluorides as to be in compliance with the Kentucky Ambient Air Quality Standards for Gaseous Fluorides specified in Regulation 401 KAR 53:010.

2. SHAMROCK TECHNOLOGIES, INC.

The Universal Transverse Mercator (UTM) coordinates at the approximate center of the Shamrock facility are 443580.94 m E, 4184471.14 m N (North American Datum of 1983 [NAD83] Zone 16). An aerial view of the facility site area is provided in Figure 2-1. This project is required to demonstrate air quality impacts for Hydrogen Fluoride (HF) emissions from the proposed project at the Shamrock facility. Predicted impacts are compared to the Kentucky Ambient Air Quality Standards for Gaseous Fluorides specified in Regulation 401 KAR 53:010. If predicted impacts are above any applicable threshold, impacts would be evaluated to determine that the area where predicted impacts are above the threshold are limited in magnitude and extent.

A brief description of the site characteristics and facility operations is provided in Section 2.1 below.

FIGURE 2-1 PROJECT SITE AERIAL PHOTO

2.1 FACILITY DESCRIPTION

Shamrock operates a polytetrafluoroethylene (PTFE) processing facility located on Community Drive in Henderson, Kentucky. The PTFE used in the process is sourced from industrial, pre-consumer waste, including scrap and off-spec materials. The facility releases fluorides as HF from its operations at the site. These emission points are from:

TABLE 2-1 EMISSION UNITS THAT POTENTIALLY RELEASE FLUORIDES

Emission Unit	Emission Unit ID	Scrubber Control	Exhaust
ICT Vault	B1	None	B-1
3 ICT Product Filters	B3-3	Scrubber 3	B-8
E-Beam 3 Vault	B5	None	B-5
4 Material Recovery Filters	B7-3	Scrubber 2	B-7
Dynamitron North Vault	D6-2	None	D-6
Dynamitron South Vault	D7-2	None	D-7
Dynamitron Product Collector	D2-3 & D10-3	None	D-2 & D-10
Five Tray Ovens	D9,D11,D12,D13,D14	Scrubber 1	B-3

3. MODELING METHODOLOGY

This report documents the assessment of the potential impacts of the proposed project and compares them with applicable standards. Specifically, the ambient criteria include annual mean HF, the maximum one-month average HF, the maximum 24-hour average HF, and the maximum 12-hour average HF. The Kentucky Ambient Air Quality Standards for Gaseous Fluorides (expressed as HF) for each averaging period of concern are provided in Table 3-1.

TABLE 3-1 KENTUCKY AMBIENT AIR QUALITY STANDARDS FOR GASEOUS FLUORIDES (HF)

Pollutant	Averaging Period	Primary Standard (µg/m³)	Secondary Standard (µg/m³)
HF	Annual*	400	--
	Monthly**	--	0.82
	24-hour**	800	2.86
	12-hour**	--	3.68

* Annual standard not to be exceeded

** Short term standards can be exceeded once per year.

3.1 OVERVIEW OF METHODOLOGY

The dispersion modeling was conducted using version 24142 of U.S. EPA’s American Meteorological Society/ Environmental Protection Agency Regulatory Model (AERMOD). AERMOD is recommended by the 2024 Appendix W Guidance for determining near field impacts (impacts within a 50-km radius of the facility) and is approved for regulatory determinations. The AERMOD modeling system incorporates several preprocessors, including:

- The latest version of AERMOD (version 24142) was used with regulatory default options in the rural mode.
- The AERMAP (version 24142) processor program was used to calculate terrain elevations and hill heights for all modeled receptors (NAD83 datum and UTM Zone 16) using 1/3-arcsecond National Elevation Data (NED).
- Each stack was evaluated in terms of its proximity to nearby buildings/structures to determine if stack discharges might become caught in the turbulent wakes of these buildings/structures utilizing EPA’s Building Profile Input Program PRIME (BPIP-PRIME, version 04274). Figure 3-1 and Figure 3-2 show emission sources relative to building structures.
- Five years (2020 – 2024) of AERMOD-ready meteorological data were provided by the Kentucky Division for Air Quality (Kentucky DAQ). The data were processed with AERMET (version 24142). See Section 3.5 for further discussion of meteorological data set selection.
- AERSURFACE (version 24142) is a tool used to determine surface characteristics for use in AERMET.
- AERMINUTE (version 15272) is a preprocessor used to calculate the hourly wind data for use in AERMET.

All model assessments were performed using the regulatory default options. AERMOD calculated concentrations at each receptor for each hour of meteorological data. Pollutant concentrations were averaged over short-term or annual averaging periods as required by the applicable ambient air quality standard averaging period. All modeling files will be provided in a separately submitted electronic modeling archive.

The facility is located on mostly rural land in Henderson, Kentucky and rural dispersion coefficients were used. The Land Use Classification for this determination is discussed in Section 3.7.

FIGURE 3-1 LOCATION OF ALL EMISSION SOURCES IN RELATION TO BUILDINGS

FIGURE 3-2 LOCATION OF ALL EMISSION POINT SOURCES

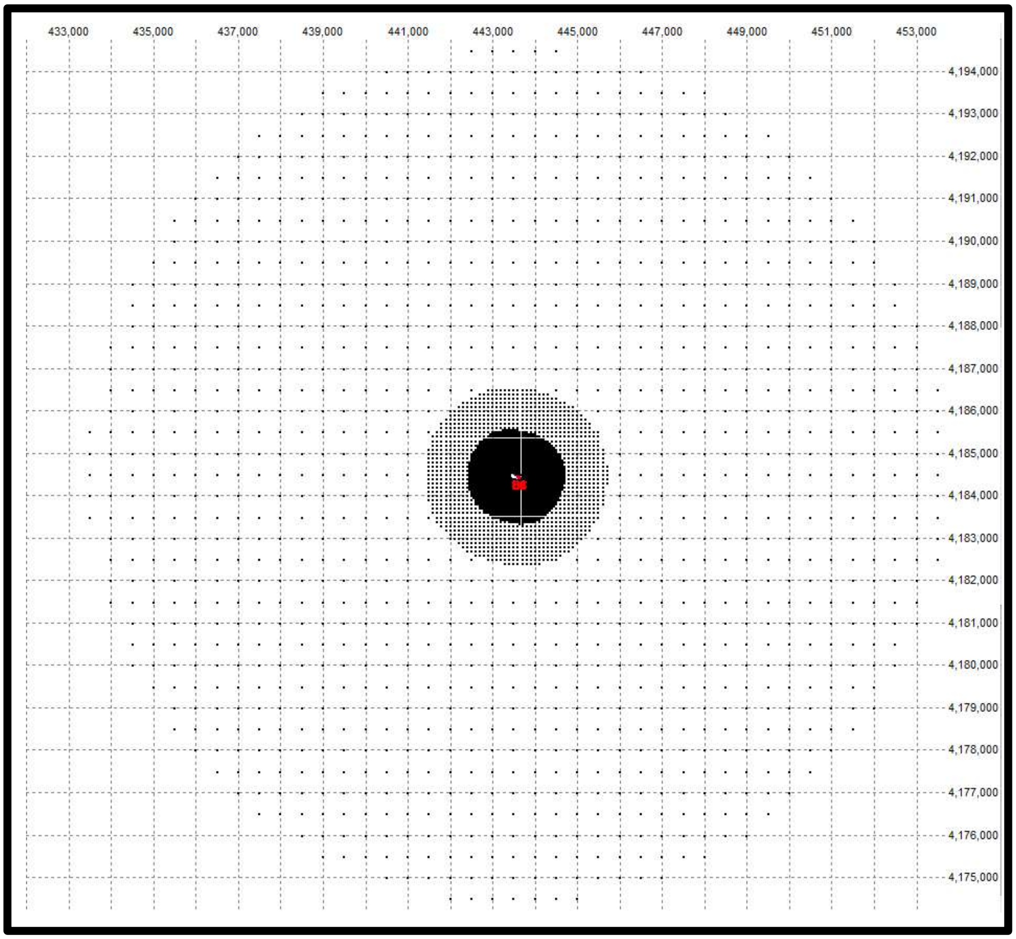
3.2 DESCRIPTION OF THE AIR QUALITY DISPERSION MODEL

The modeling was performed using AERMOD version 24142. AERMOD is a US EPA-approved, steady state Gaussian plume model approved for industrial sources and capable of modeling multiple sources in simple and complex terrain. Regulatory default options were used in the analysis.

3.3 RECEPTOR GRID

Receptors are placed along the ambient air boundary with 10-meter grid spacing. Beyond the ambient air boundary, receptors are placed at 50-meter grid spacing out to 1000 meters. Beyond 1,000 meters, receptors were placed with 100-meter spacing out to 2,000 meters, and 500-meter spacing between 2,000 meters and 10,000 meters, to provide enough receptor domain to ensure that the potential significant impact area is contained within the receptor grid. Figure 3-3 shows the receptor placement used in this modeling assessment.

FIGURE 3-3 NEAR-FIELD RECEPTOR GRID



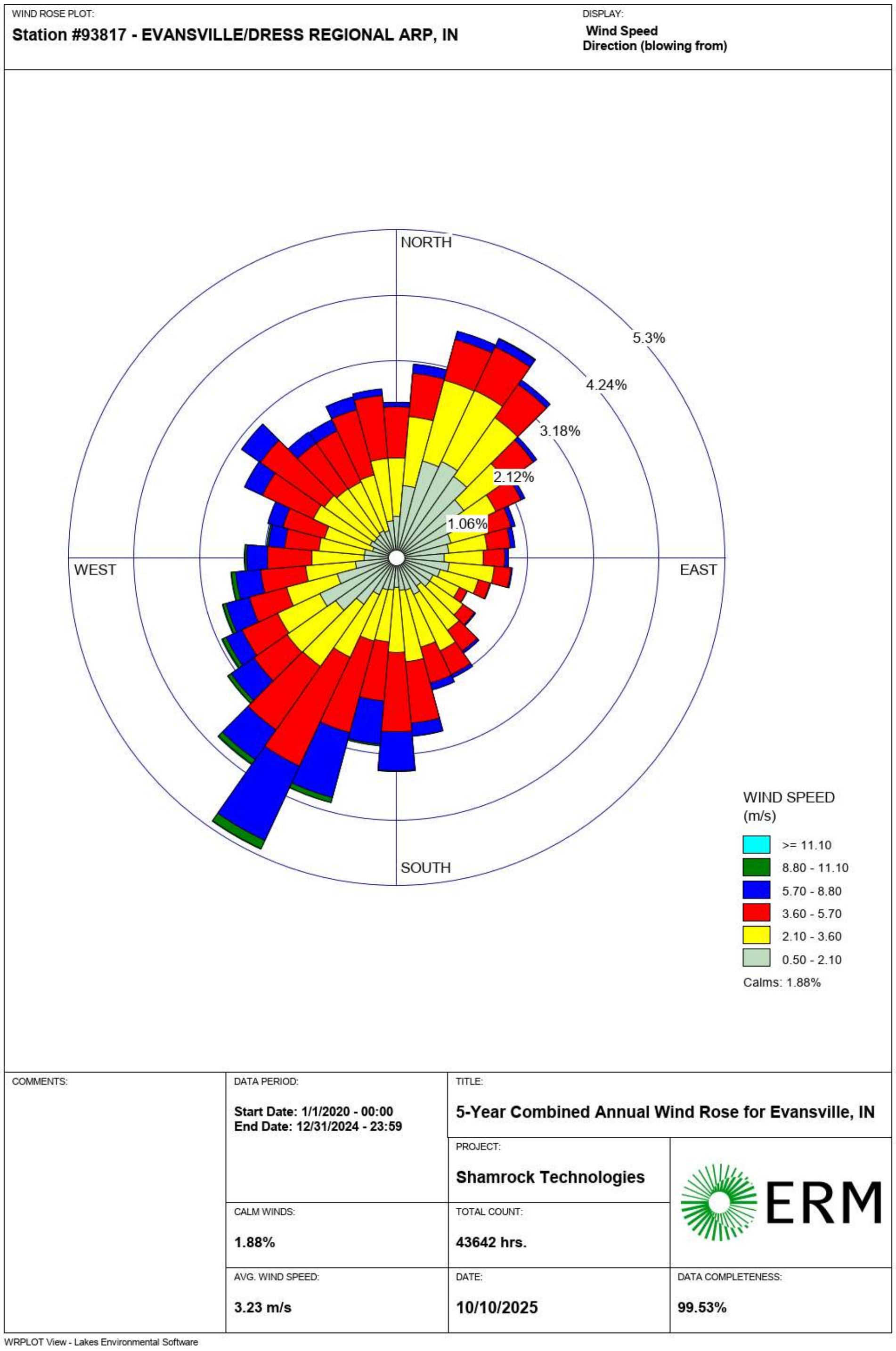
3.4 TERRAIN

The latest version of the AERMAP program (version 24142) was used to process United States Geological Survey (USGS) 1/3-arcsecond resolution NED terrain files to develop hill scale and terrain elevation inputs for each receptor. All coordinates are based on the NAD83 datum (Zone 16).

3.5 METEOROLOGICAL DATA

EPA air quality modeling guidance recommends the use of either one year of onsite meteorological data or five years of representative off-site data. Five years (2020-2024) of AERMOD-ready meteorological data was provided by the Kentucky DAQ for use in the modeling. The Surface Station ID is Evansville Regional Airport (Station ID 93817), and the Upper Air Station ID is Nashville/Old Hickory, TN (Station ID 72327). All meteorological surface data is derived from 1-hour integrated surface hourly data and one-minute ASOS data (DSI-6405) from the National Weather Service for the years 2020-2024. A wind rose plot from the Evansville Regional Airport is shown in Figure 3-4.

FIGURE 3-4 WIND ROSE PLOT



WIND ROSE PLOT:
Station #93817 - EVANSVILLE/DRESS REGIONAL ARP, IN

DISPLAY:
Wind Speed
Direction (blowing from)

COMMENTS:

DATA PERIOD:
Start Date: 1/1/2020 - 00:00
End Date: 12/31/2024 - 23:59

TITLE:
5-Year Combined Annual Wind Rose for Evansville, IN

PROJECT:
Shamrock Technologies

CALM WINDS:
1.88%

TOTAL COUNT:
43642 hrs.

AVG. WIND SPEED:
3.23 m/s

DATE:
10/10/2025

DATA COMPLETENESS:
99.53%

WRPLOT View - Lakes Environmental Software

3.6 BUILDING DOWNWASH

Emissions from point sources may become entrained in the turbulent wakes generated by buildings and other nearby structures. To account for building downwash effects on emissions, building dimensions and locations were entered into the U.S. EPA approved BPIP-PRIME (version 04274) software. BPIP-PRIME creates direction-specific structure dimensions and the dominant downwash structure parameters which are incorporated, via AERMOD, into the dispersion model for the purpose of estimating the impact of aerodynamic downwash. In running BPIP-PRIME, a Good Engineering Practice (GEP) stack height evaluation was conducted based on the specifications of facility buildings and structures according to U.S. EPA procedures.[1]

3.7 LAND USE

The selection of either rural or urban dispersion coefficients followed the procedures listed in 40 CFR 51 Appendix W Section 7.2.1. The preferred Land Use Procedure classifies the land use within a 3-km radius circle about the source using the Auer land use typing scheme. If the urban Auer land use types I1, I2, C1, R2, and R3 (Industrial, Commercial, and Compact Residential) account for 50 percent or more of the area within 3-km of the site, urban dispersion coefficients should be used. Sources located in areas defined as rural should be modeled using the rural dispersion parameters.

Figure 3-5 shows that the majority of the land use surrounding the proposed project site is considered rural. Therefore, the project was characterized as rural in the AERMOD modeling analysis.

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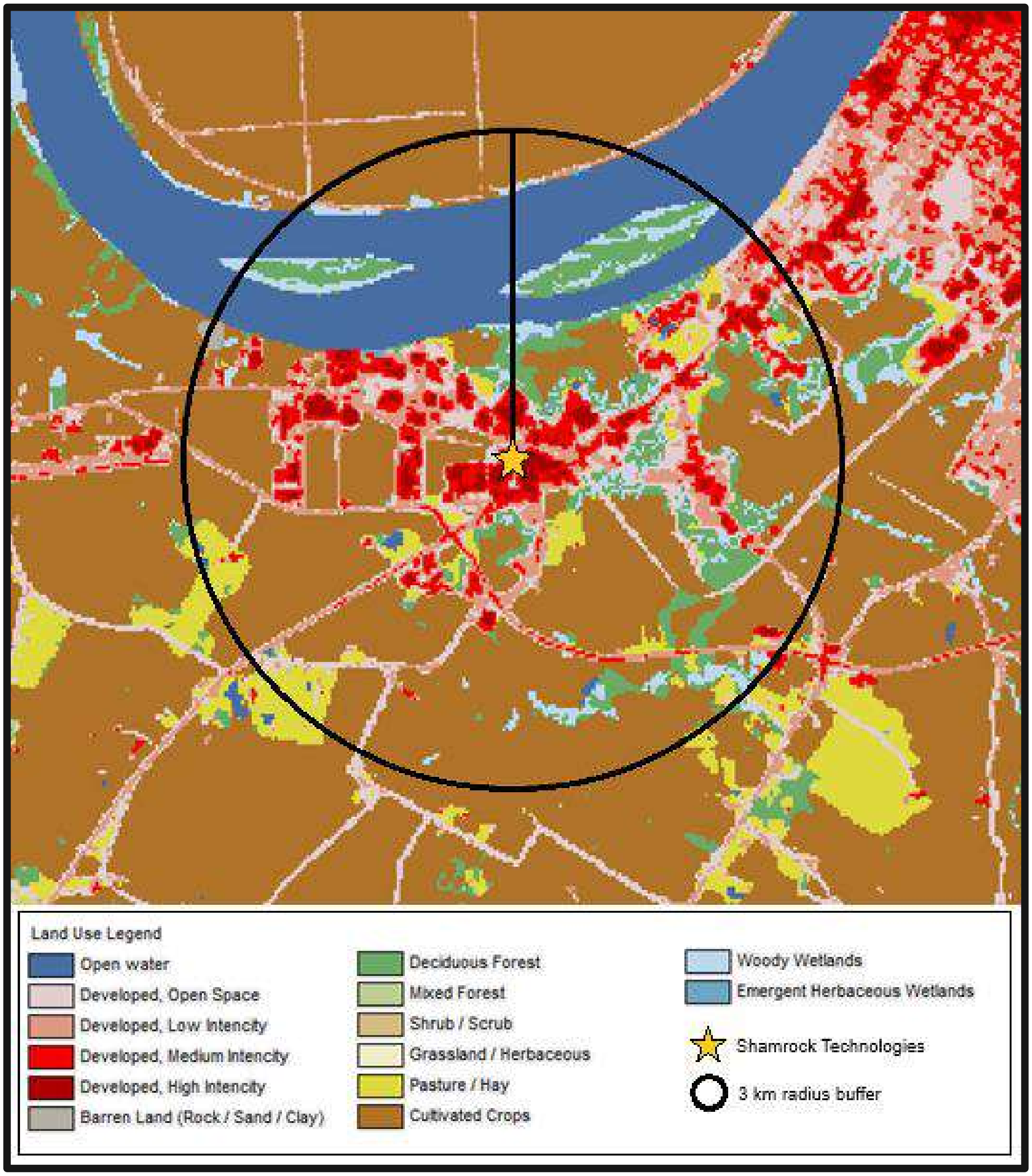
[1] U.S. Environmental Protection Agency, Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) (Revised), June 1985.

FIGURE 3-5 LAND-USE COEFFICIENT DETERMINATION FOR AERMOD MODELING



3.8 SOURCE PARAMETERS AND EMISSION RATES

Modeled emission rates for HF are based on each source's potential to emit (PTE) after consideration of all enforceable operational restrictions and/or emissions limitations. All stack emissions with vertical momentum were modeled as point sources.

For point sources, stack heights and other stack exit parameters specified in the proposed design documents were used to define the characteristics of the exhaust flow from each emission unit. In addition, the stack and building locations and dimensions were input to AERMOD to assess potential downwash effects. Stack parameters and locations of stacks and buildings are based on current design documents for the facility.

Wind direction-specific building profiles were prepared by using the U.S. EPA's currently approved version of the Building Profile Input Program – Plume Rise Model Enhancements "BPIP PRIME" software (version 04274).

All source parameters and emission rates are provided in Appendix A.

4. MODELING ANALYSIS

4.1 AIR TOXICS ANALYSIS

The proposed project includes the potential to emit toxic air contaminants, including:

- Hydrogen Fluoride

The facility is considered a conditional major source for Hazardous Air Pollutants (HAPs). The HF compound is defined as a HAP subject to the State of Kentucky Administrative Regulations 401 KAR 63:060. As such, an ambient air quality analysis was conducted for this compound to demonstrate ambient concentrations resulting from the air toxic emissions would not exceed the Kentucky Ambient Air Quality Standards for Gaseous Fluorides.

4.2 AIR TOXICS RESULTS & CONCLUSIONS

Kentucky Ambient Air Quality Standards for Gaseous Fluoride requires a source to compare the maximum predicted Annual, Monthly, 24-hour, and 12-hour concentration under worst-case meteorology to determine whether the project's emissions have the potential to cause adverse impacts to human health. Table 4-1 provides the maximum concentrations in comparison to their respective standard for the HF compound included in this analysis.

Furthermore, since the AERMOD model does not have a mechanism to account for gases such as HF, to account for HF plume reactivity, Kentucky DAQ recommends applying percent reduction factors to dispersion modeling results. The reduction factors are contained in a June 23, 2009, DAQ draft memo, provided as Appendix B. The reduction factor methodology is:

Given that X (feet) = the maximum distance from the tallest emission source to the receptor location

- For X < 70 feet, HF concentration reduction = 10%
- For X > 2,300 feet, HF concentration reduction = 50%
- For X between 70 and 2,300 feet, HF concentration reduction (%) = 0.0181 X + 8.74

These reduction factors were applied to the AERMOD modeling results to estimate the Annual, Monthly, 24-hour, and 12-hour ambient HF concentrations. These resulting adjusted concentrations were then compared to the gaseous HF standards.

As identified in Table 4-1, the maximum ground-level concentrations for HF are less than the applicable Kentucky Ambient Air Quality standard. Therefore, no further analysis is warranted to demonstrate that potential emissions from the Shamrock emission sources will not cause adverse human or environmental impacts for hydrogen fluoride.

Figure 4-1 through Figure 4-4 illustrate the location of maximum impact of the adjusted modeled concentrations of hydrogen fluoride.

TABLE 4-1 PREDICTED HYDROGEN FLUORIDE IMPACTS

Averaging Period	**Maximum Concentration (μg/m^3)**	**Adjusted Concentration (μg/m^3)**	**Primary Standard (μg/m^3)**	**Secondary Standard (μg/m^3)**
Annual*	0.46	0.37	400	--
Monthly*	0.71	0.54	--	0.82
12-hour	4.55	3.58	800	3.68
24-hour	3.49	2.73	--	2.86

*Maximum unadjusted concentration occurs at a different location than the maximum adjusted concentration. Maximum impacts represent the adjusted concentration compared to the standard.

FIGURE 4-1 HYDROGEN FLUORIDE (HF) MAXIMUM ANNUAL CONCENTRATION

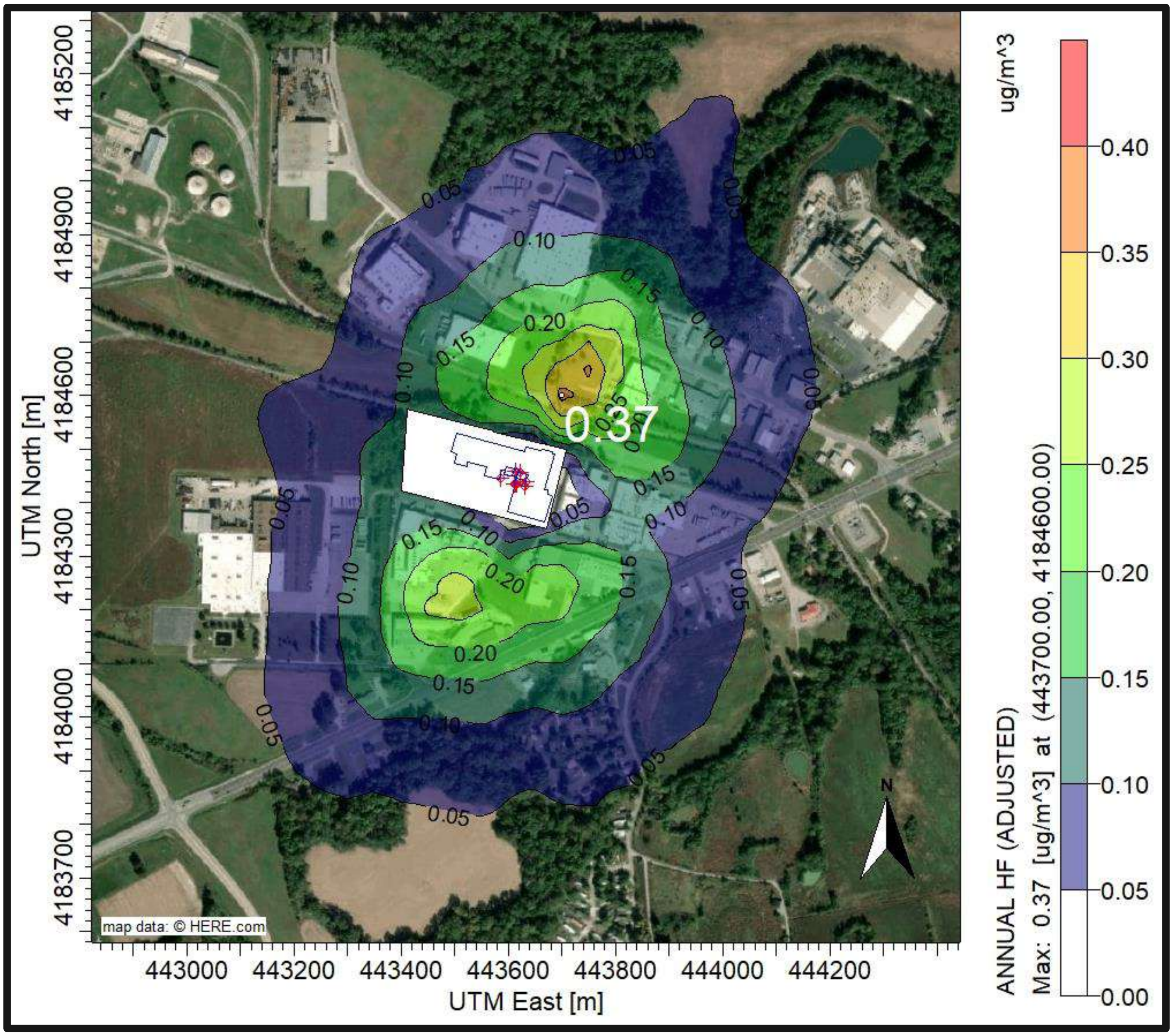


FIGURE 4-2 HYDROGEN FLUORIDE (HF) MAXIMUM MONTHLY CONCENTRATION

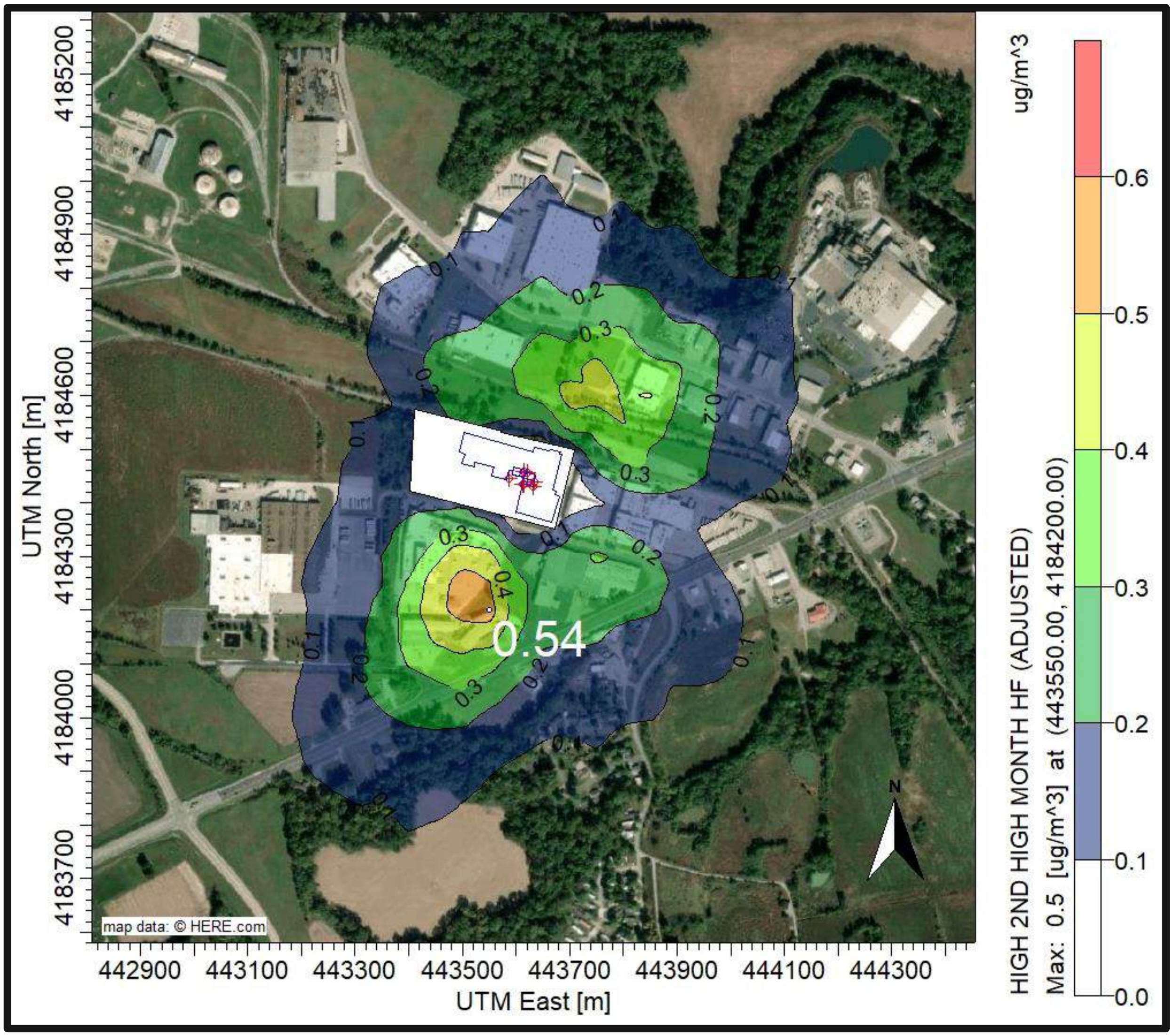


FIGURE 4-3 HYDROGEN FLUORIDE (HF) MAXIMUM 24-HOUR CONCENTRATION

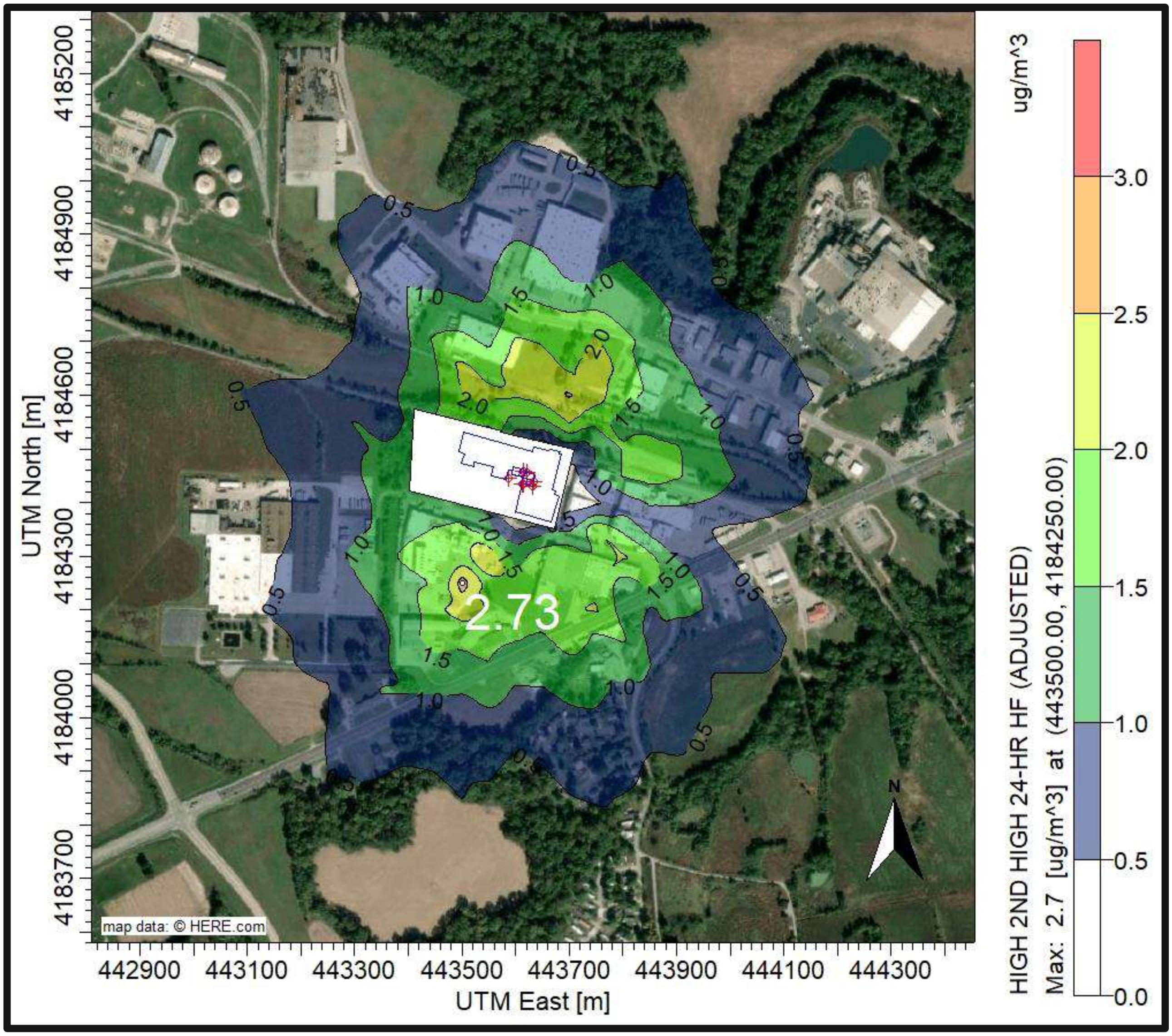
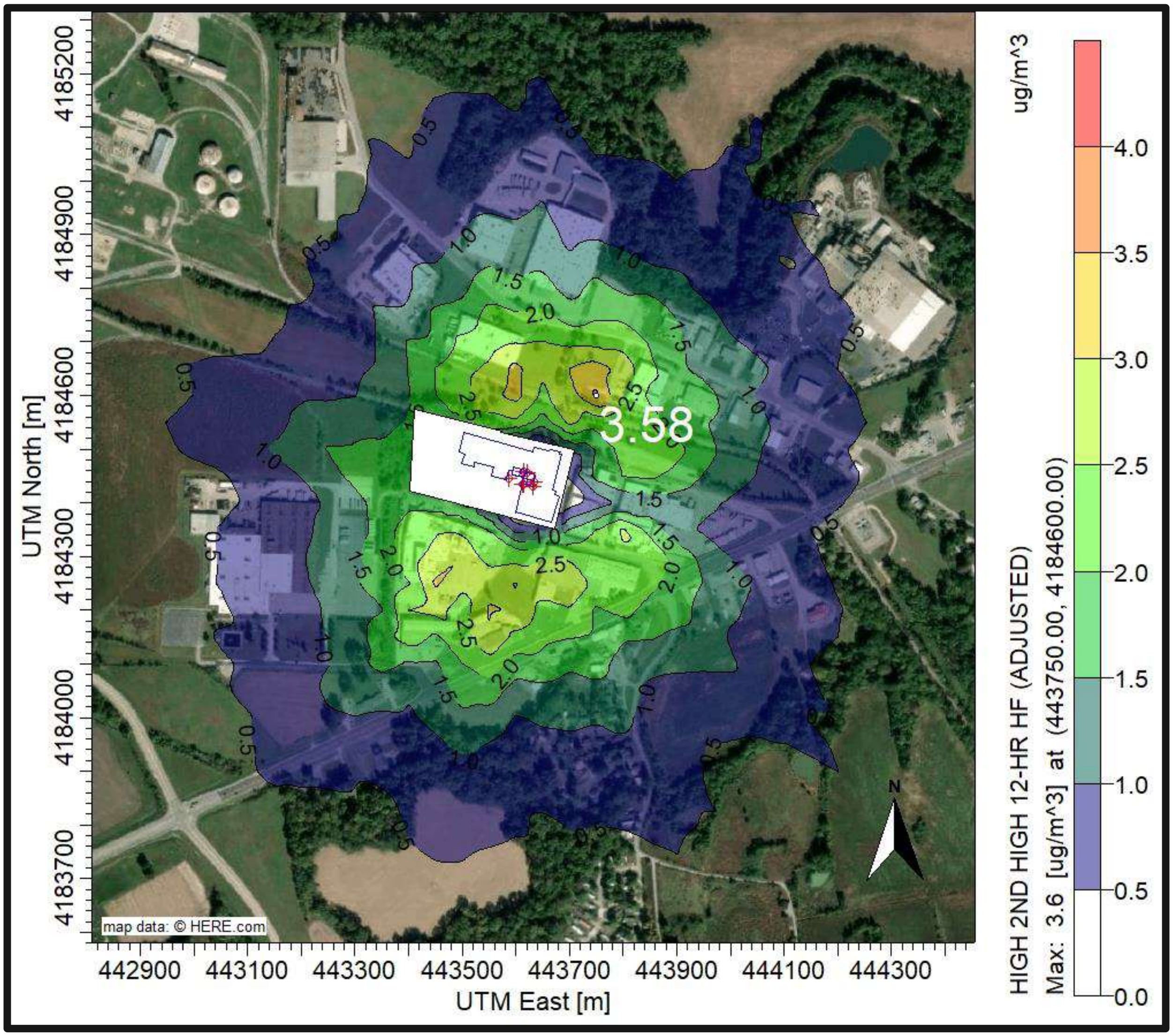


FIGURE 4-4 HYDROGEN FLUORIDE (HF) MAXIMUM 12-HOUR CONCENTRATION



5. SUMMARY

The various assessments of air quality and other environmental impacts have demonstrated the maximum modeled Annual, Monthly, 24-hour and 12-hour HF concentrations do not exceed the Kentucky Ambient Air Quality Standards for Gaseous Fluorides.

APPENDIX A SOURCE PARAMETERS AND EMISSION RATES

Shamrock Technologies, Inc. KY

Appendix A - Source Parameters and Emission Rates

Source ID	Source Description	Easting (X)	Northing (Y)	Base Elevation	Stack Height	Temperature	Exit Velocity	Stack Diameter	HF
		(m)	(m)	(ft)	(ft)	(°F)	(fps)	(in)	(lb/hr)
B3	Scrubber #1 exhaust	443621.58	4184431.78	385	80.0	68.0	161.3	12	0.14800
D2	D-2 Dynamitron product collectors	443629.08	4184454.35	385	47.3	83.9	57.6	12	0.00209
D6	D-6 Dynamitron north vault exhaust	443641.28	4184437.55	385	69.7	78.5	107.5	20	0.06550
D7	D-7 Dynamitron south vault exhaust	443638.73	4184428.3	385	69.7	76.7	106.9	20	0.08040
B7	Beam 3 Scrubber #2 exhaust	443622.7	4184431.44	385	80.0	68.0	130.5	12	0.31310
B8	Scrubber #3 exhaust	443620.2	4184432.21	385	80.0	68.0	139.1	12	0.22440
B5	E-Beam 3 Lower Vault Exhaust	443594.05	4184442.56	385	60.0	68.0	154.0	12	0.00382
B1	ICT Lower Vault Exhaust	443621.49	4184455.8	385	56.8	68.0	87.3	14	0.00423

APPENDIX B KENTUCKY DAQ HYDROGEN FLUORIDE PLUME REACTIVITY DRAFT MEMO

Steven L. Beshear
Governor

Energy and Environment Cabinet
Department for Environmental Protection
Division for Air Quality
200 Fair Oaks Lane, 1st Floor
Frankfort, Kentucky 40601
www.air.ky.gov

Leonard K. Peters
Secretary

To: Andrew True

From: Kevin Davis

Date: June 23, 2009

Subject: Hydrogen Fluoride Plume Reactivity / Reduction Factor
Note - This is a guidance document for modeling HF only, not estimating emissions.

Mr. Andrew True,

The Kentucky Division for Air Quality (The Division) has authorized the application of reduction factors for predicting the maximum Hydrogen Fluoride (HF) modeled concentration. Using best engineering practices and scientific research, the Division will allow reduction factors based on the distance from a facility's tallest emission source to the maximum ambient air ground level impact concentration. The HF reduction factor can be utilized to show compliance with the secondary standard in Regulation 401 KAR 53:010.

The Division no longer permits the use of a blanket fifty percent reduction factor for modeled output concentrations for HF. Therefore, the Division utilized the United States Environmental Protection Agency's (U.S. EPA) Industrial Source Complex-Short Term (ISCST) dispersion model, the Pasquill-Gifford Stability Classification, and research conducted by Dr. Mark Eltroth of URS Corporation to justify a conservative reduction factor equation for HF plume reactivity.

Although ISC is no longer the recommended U.S. EPA near-field model under the 40 CFR Part 51 Appendix W, the HF reactivity / reduction scenario is compatible with modeled concentrations from AERMOD. While ISC utilizes a stability class scheme and complex terrain adjustment algorithms, AERMOD uses calculated vertical profiles and localized land use classification adjustments for meteorological and terrain processing. Plume dilution is sensitive to wind speed and potential temperature profile. The motion of air flow reflects the combination of shear and buoyancy forces. Depending on the interaction of the shear and buoyancy forces three different atmospheric conditions can exist which are stable, unstable, and neutral. For this scenario, the most conservative atmospheric conditions that would provide a similar plume spread between ISC and AERMOD would be neutral. In neutral atmospheric conditions, air motion will tend to move by shear forces and may not be subject to additional buoyant forces.

The maximum ambient air ground level concentration is represented by impact areas physically accessible to the public. These receptors may fall within undefined property boundaries per 40 CFR 50.1(e).

For HF, the percent reduction equation is Y = 0.0181 * X + 8.74. Where X is the maximum distance (feet) from the tallest emission source to the maximum ambient air impact and Y is the percent reduction of HF at that point. Figure 1 shows the percent reduction of HF in reference to the distance to the max impact under various stability classes and wind speeds.

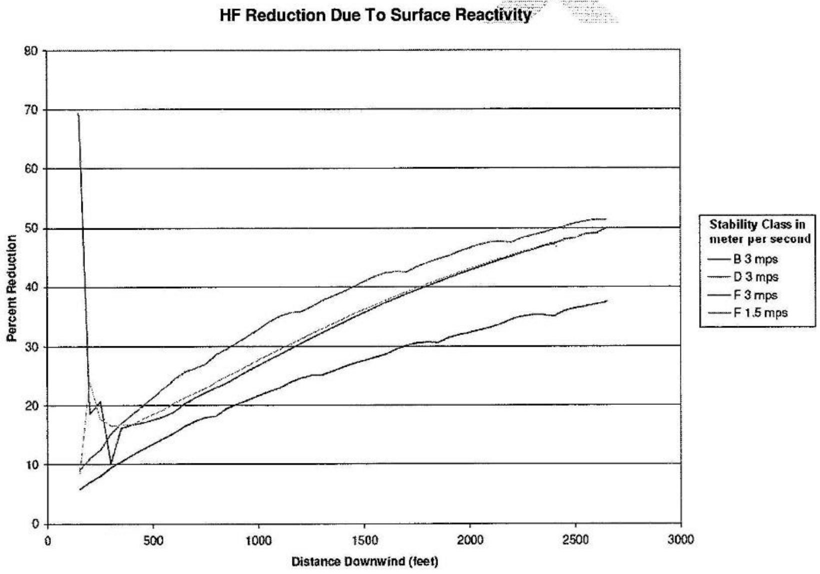


Figure 1. HF Reduction Due to Surface Reactivity for Various Meteorological Conditions

In figure 1, the curves represent the reduction of HF for the B, D, and F stability classes. The black curve represents the B stability class with a wind speed of 3 meters per second (mps). The red curve represents the D stability class with a wind speed of 3 mps. The blue and green curves represent the F stability class at 3 and 1.5 mps wind speed respectively.

Remaining as conservative as possible, The Division has implemented a minimum and maximum impact distance from the tallest emission point. Any significant impact area less than 70' from the tallest emission point will be given a ten percent reduction. In addition, any significant impact greater than 2300' from the tallest emission point will be given a fifty percent reduction. Figure 2 shows the minimum and maximum distance from the tallest point source to the significant impact area.

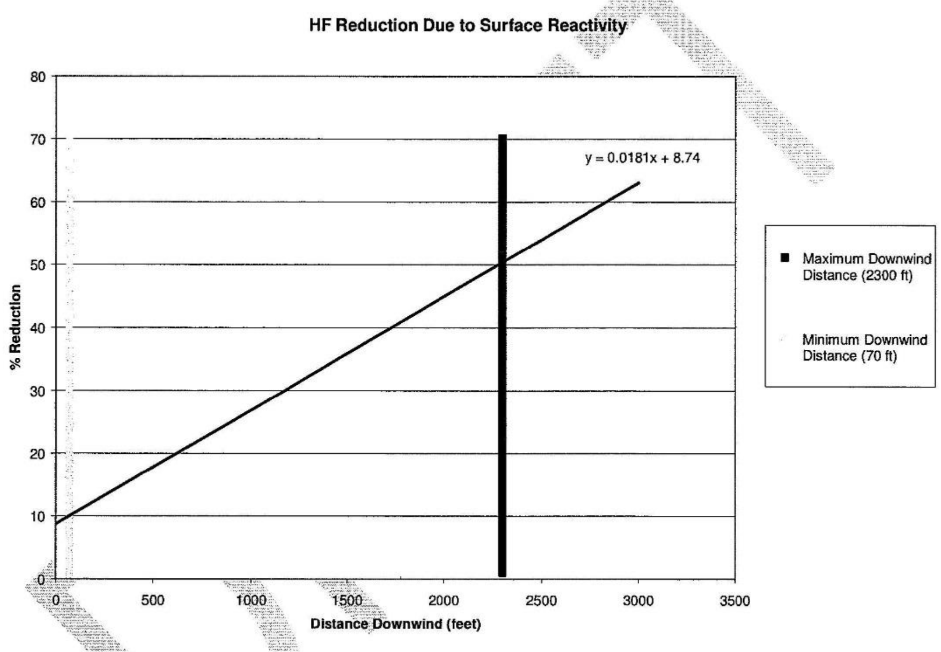


Figure 2. Minimum (<70ft) and Maximum (>2300ft) Downwind Distance from the Emission Source to Significant Impact Area will receive ten percent and fifty percent reduction, respectively

An example of a high 2nd high 24-hour plot is found in Figure 3. The red line represents the distance from the tallest emission point to the high 2nd high concentration. This would be the distance X in the percent reduction equation.

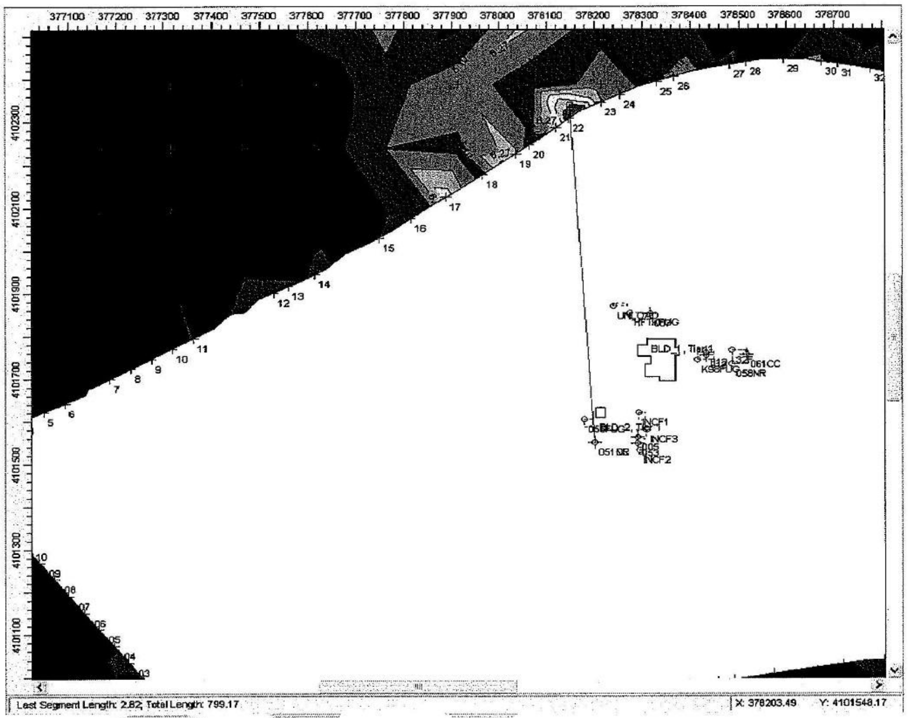


Figure 3. High 2nd High 24-hour Plot

For example, if the distance was 1200 feet from the tallest emission point to a maximum concentration point of 4.6 µg/m^3, the equation would be 0.0181*1200 + 8.74 = 30.46. A 30.5% reduction in the concentration at that point would be appropriate. Following the reduction, the concentration would be 3.2 µg/m^3.

If you have any comments or questions, please direct them to Kevin Davis via email at Kevin.Davis@KY.gov or Dr. Taimur Shaikh at Taimur.Shaikh@KY.gov or via telephone at (502)564-3999.

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ATTACHMENT E ENGINEERING SOURCE MEASUREMENTS

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	HF (ppmv)	Flow DSCFM	HF Surrogate Rate	Block Hourly HF Surrogate Rate
4/21/2009	**18:29:22**	1.3			
4/21/2009	**18:30:28**	1.3			
4/21/2009	**18:31:30**	1.2			
4/21/2009	**18:32:32**	1.2			
4/21/2009	**18:33:34**	1.1			
4/21/2009	**18:34:37**	1.1			
4/21/2009	**18:35:40**	1.1			
4/21/2009	**18:36:41**	1.1			
4/21/2009	**18:37:44**	1.0			
4/21/2009	**18:38:47**	1.0			
4/21/2009	**18:39:48**	1.0			
4/21/2009	**18:40:51**	0.9			
4/21/2009	**18:41:53**	1.0			
4/21/2009	**18:42:59**	1.0	290	287	
4/21/2009	**18:44:01**	0.9	308	290	
4/21/2009	**18:45:04**	1.0	299	289	
4/21/2009	**18:46:06**	1.0	285	280	
4/21/2009	**18:47:08**	0.9	292	271	
4/21/2009	**18:48:11**	0.9	287	267	
4/21/2009	**18:49:13**	1.0	310	307	
4/21/2009	**18:50:15**	1.0	303	300	
4/21/2009	**18:51:18**	1.0	315	315	
4/21/2009	**18:52:19**	1.0	304	311	
4/21/2009	**18:53:22**	1.1	294	313	
4/21/2009	**18:54:25**	1.1	298	333	
4/21/2009	**18:55:26**	1.1	308	343	
4/21/2009	**18:56:29**	1.1	300	325	
4/21/2009	**18:57:32**	1.2	301	346	
4/21/2009	**18:58:33**	1.1	286	326	
4/21/2009	**18:59:36**	1.2	298	348	
4/21/2009	**19:00:39**	1.3	303	385	
4/21/2009	**19:01:40**	1.3	292	379	
4/21/2009	**19:02:43**	1.4	310	424	
4/21/2009	**19:03:46**	1.5	292	430	
4/21/2009	**19:04:47**	1.6	285	450	
4/21/2009	**19:05:50**	1.7	301	526	
4/21/2009	**19:06:52**	1.9	303	583	
4/21/2009	**19:07:54**	2.2	294	637	
4/21/2009	**19:08:57**	2.4	287	695	
4/21/2009	**19:09:59**	2.7	305	831	
4/21/2009	**19:11:01**	3.1	304	939	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	**HF (ppmv)**	**Flow DSCFM**	**HF Surrogate Rate**	**Block Hourly HF Surrogate Rate**
4/21/2009	**19:12:04**	3.6	305	1,104	
4/21/2009	**19:13:06**	4.1	305	1,265	
4/21/2009	**19:14:08**	4.8	298	1,418	
4/21/2009	**19:15:11**	5.5	277	1,511	
4/21/2009	**19:16:13**	6.2	301	1,877	
4/21/2009	**19:17:15**	7.2	296	2,143	
4/21/2009	**19:18:18**	8.1	289	2,350	
4/21/2009	**19:19:20**	9.3	281	2,630	
4/21/2009	**19:20:22**	10.7	301	3,212	
4/21/2009	**19:21:25**	12.1	297	3,595	
4/21/2009	**19:22:27**	13.3	297	3,952	
4/21/2009	**19:23:29**	15.1	297	4,473	
4/21/2009	**19:24:31**	16.9	297	5,033	
4/21/2009	**19:25:33**	18.7	297	5,555	
4/21/2009	**19:26:36**	20.6	297	6,129	
4/21/2009	**19:27:39**	22.8	297	6,771	
4/21/2009	**19:28:40**	25.0	297	7,418	
4/21/2009	**19:29:43**	27.4	297	8,125	
4/21/2009	**19:30:45**	30.0	297	8,917	
4/21/2009	**19:31:48**	32.6	297	9,674	
4/21/2009	**19:32:50**	35.3	297	10,497	
4/21/2009	**19:33:52**	38.3	297	11,375	
4/21/2009	**19:34:54**	41.7	297	12,393	
4/21/2009	**19:35:57**	45.3	297	13,465	
4/21/2009	**19:37:01**	50.0	297	14,862	
4/21/2009	**19:38:03**	52.8	297	15,696	
4/21/2009	**19:39:05**	56.7	297	16,850	
4/21/2009	**19:40:08**	60.7	297	18,037	
4/21/2009	**19:41:18**	65.0	297	19,297	
4/21/2009	**19:42:34**	72.1	297	21,418	
4/21/2009	**19:43:38**	78.3	297	23,242	4,675
4/21/2009	**19:44:41**	83.7	297	24,870	
4/21/2009	**19:45:48**	86.8	297	25,780	
4/21/2009	**19:47:12**	98.9	297	29,377	
4/21/2009	**19:48:15**	104.9	297	31,160	
4/21/2009	**19:49:16**	112.3	297	33,357	
4/21/2009	**19:50:39**	124.4	297	36,942	
4/21/2009	**19:52:09**	138.1	297	41,010	
4/21/2009	**19:53:14**	147.2	297	43,707	
4/21/2009	**19:54:30**	164.4	297	48,816	
4/21/2009	**19:56:01**	201.1	297	59,715	
4/21/2009	**19:57:22**	216.6	297	64,334	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	HF (ppmv)	Flow DSCFM	HF Surrogate Rate	Block Hourly HF Surrogate Rate
4/21/2009	**19:58:24**	234.1	297	69,518	
4/21/2009	**19:59:37**	276.9	297	82,249	
4/21/2009	**20:00:55**	257.1	297	76,369	
4/21/2009	**20:02:22**	277.7	297	82,474	
4/21/2009	**20:03:45**	315.6	297	93,721	
4/21/2009	**20:05:30**	452.3	297	134,322	
4/21/2009	**20:06:32**	425.7	297	126,445	
4/21/2009	**20:07:35**	442.3	297	131,366	
4/21/2009	**20:08:50**	431.5	297	128,143	
4/21/2009	**20:09:53**	481.9	297	143,113	
4/21/2009	**20:10:56**	484.4	297	143,877	
4/21/2009	**20:12:01**	524.1	297	155,660	
4/21/2009	**20:13:03**	530.1	297	157,430	
4/21/2009	**20:14:06**	534.2	297	158,649	
4/21/2009	**20:15:08**	538.8	297	160,026	
4/21/2009	**20:16:12**	545.7	297	162,059	
4/21/2009	**20:17:29**	621.9	297	184,715	
4/21/2009	**20:18:32**	570.4	297	169,398	
4/21/2009	**20:19:34**	566.9	297	168,380	
4/21/2009	**20:20:36**	574.9	297	170,738	
4/21/2009	**20:21:39**	584.7	297	173,662	
4/21/2009	**20:22:41**	583.9	297	173,411	
4/21/2009	**20:23:45**	588.6	297	174,819	
4/21/2009	**20:24:47**	586.1	297	174,068	
4/21/2009	**20:25:50**	609.1	297	180,901	
4/21/2009	**20:26:51**	600.2	297	178,266	
4/21/2009	**20:27:54**	596.9	297	177,271	
4/21/2009	**20:28:56**	572.2	297	169,935	
4/21/2009	**20:29:59**	584.6	297	173,613	
4/21/2009	**20:31:03**	605.5	297	179,821	
4/21/2009	**20:32:06**	612.6	297	181,943	
4/21/2009	**20:33:07**	611.0	297	181,457	
4/21/2009	**20:34:10**	578.3	297	171,764	
4/21/2009	**20:35:12**	562.7	297	167,122	
4/21/2009	**20:36:14**	573.0	297	170,195	
4/21/2009	**20:37:17**	589.6	297	175,112	
4/21/2009	**20:38:19**	590.1	297	175,248	
4/21/2009	**20:39:21**	566.2	297	168,170	
4/21/2009	**20:40:24**	556.1	297	165,161	
4/21/2009	**20:41:25**	567.2	297	168,456	
4/21/2009	**20:42:28**	580.4	297	172,387	
4/21/2009	**20:43:37**	597.0	297	177,311	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	**HF (ppmv)**	**Flow DSCFM**	**HF Surrogate Rate**	**Block Hourly HF Surrogate Rate**
4/21/2009	**20:44:42**	562.2	297	166,969	
4/21/2009	**20:45:43**	541.4	297	160,797	
4/21/2009	**20:46:47**	544.7	297	161,790	
4/21/2009	**20:47:50**	555.9	297	165,097	
4/21/2009	**20:48:52**	569.8	297	169,245	
4/21/2009	**20:49:55**	552.7	297	164,154	
4/21/2009	**20:50:56**	531.6	297	157,872	135,229
4/21/2009	**20:52:01**	529.6	297	157,291	
4/21/2009	**20:53:03**	531.1	297	157,744	
4/21/2009	**20:54:09**	548.2	297	162,804	
4/21/2009	**20:55:11**	533.7	297	158,512	
4/21/2009	**20:56:13**	522.7	297	155,229	
4/21/2009	**20:57:21**	511.6	297	151,952	
4/21/2009	**20:58:31**	517.2	297	153,623	
4/21/2009	**20:59:34**	518.5	297	153,994	
4/21/2009	**21:00:36**	512.4	297	152,174	
4/21/2009	**21:01:38**	496.0	297	147,304	
4/21/2009	**21:02:43**	480.7	297	142,771	
4/21/2009	**21:03:44**	476.3	297	141,467	
4/21/2009	**21:04:47**	464.0	297	137,796	
4/21/2009	**21:05:49**	496.1	297	147,345	
4/21/2009	**21:06:51**	486.2	297	144,388	
4/21/2009	**21:07:54**	475.1	297	141,115	
4/21/2009	**21:08:56**	445.9	297	132,428	
4/21/2009	**21:09:58**	468.7	297	139,209	
4/21/2009	**21:11:01**	467.5	297	138,841	
4/21/2009	**21:12:03**	490.4	297	145,661	
4/21/2009	**21:13:06**	468.2	297	139,057	
4/21/2009	**21:14:07**	446.5	297	132,613	
4/21/2009	**21:15:10**	444.8	297	132,115	
4/21/2009	**21:16:13**	449.4	297	133,459	
4/21/2009	**21:17:15**	461.8	297	137,148	
4/21/2009	**21:18:17**	457.9	297	135,983	
4/21/2009	**21:19:20**	445.8	297	132,406	
4/21/2009	**21:20:22**	425.7	297	126,446	
4/21/2009	**21:21:24**	450.4	297	133,758	
4/21/2009	**21:22:27**	456.2	297	135,494	
4/21/2009	**21:23:28**	438.5	297	130,225	
4/21/2009	**21:24:31**	427.2	297	126,874	
4/21/2009	**21:25:34**	437.5	297	129,938	
4/21/2009	**21:26:35**	427.6	297	127,004	
4/21/2009	**21:27:38**	436.6	297	129,665	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	**HF (ppmv)**	**Flow DSCFM**	**HF Surrogate Rate**	**Block Hourly HF Surrogate Rate**
4/21/2009	**21:28:41**	430.1	297	127,738	
4/21/2009	**21:29:42**	439.2	297	130,454	
4/21/2009	**21:30:45**	342.2	297	101,643	
4/21/2009	**21:31:48**	411.3	297	122,170	
4/21/2009	**21:32:49**	416.1	297	123,574	
4/21/2009	**21:33:52**	411.2	297	122,133	
4/21/2009	**21:34:55**	414.9	297	123,224	
4/21/2009	**21:35:56**	408.0	297	121,180	
4/21/2009	**21:36:59**	392.8	297	116,647	
4/21/2009	**21:38:01**	379.7	297	112,760	
4/21/2009	**21:39:03**	376.4	297	111,791	
4/21/2009	**21:40:06**	390.7	297	116,039	
4/21/2009	**21:41:08**	345.1	297	102,485	
4/21/2009	**21:42:10**	384.0	297	114,054	
4/21/2009	**21:43:13**	364.0	297	108,113	
4/21/2009	**21:44:15**	368.6	297	109,470	
4/21/2009	**21:45:17**	356.6	297	105,918	
4/21/2009	**21:46:20**	358.9	297	106,593	
4/21/2009	**21:47:22**	348.3	297	103,440	
4/21/2009	**21:48:24**	349.0	297	103,649	
4/21/2009	**21:49:27**	340.8	297	101,203	
4/21/2009	**21:50:29**	341.8	297	101,524	
4/21/2009	**21:51:31**	341.5	297	101,437	
4/21/2009	**21:52:33**	340.1	297	100,999	
4/21/2009	**21:53:36**	320.9	297	95,304	128,790
4/21/2009	**21:54:39**	343.7	297	102,088	
4/21/2009	**21:55:45**	333.4	297	99,019	
4/21/2009	**21:56:48**	319.9	297	95,012	
4/21/2009	**21:57:50**	325.0	297	96,533	
4/21/2009	**21:58:52**	326.4	297	96,948	
4/21/2009	**21:59:55**	315.7	297	93,768	
4/21/2009	**22:00:57**	309.2	297	91,833	
4/21/2009	**22:01:59**	315.9	297	93,813	
4/21/2009	**22:03:02**	314.3	297	93,335	
4/21/2009	**22:04:04**	310.5	297	92,224	
4/21/2009	**22:05:06**	304.4	297	90,416	
4/21/2009	**22:06:09**	302.7	297	89,889	
4/21/2009	**22:07:10**	311.4	297	92,488	
4/21/2009	**22:08:13**	298.0	297	88,500	
4/21/2009	**22:09:16**	297.2	297	88,272	
4/21/2009	**22:10:18**	296.4	297	88,017	
4/21/2009	**22:11:20**	293.1	297	87,038	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	HF (ppmv)	Flow DSCFM	HF Surrogate Rate	Block Hourly HF Surrogate Rate
4/21/2009	**22:12:23**	293.5	297	87,174	
4/21/2009	**22:13:25**	285.0	297	84,649	
4/21/2009	**22:14:27**	286.5	297	85,081	
4/21/2009	**22:15:30**	271.4	297	80,596	
4/21/2009	**22:16:35**	282.3	297	83,830	
4/21/2009	**22:17:37**	271.0	297	80,500	
4/21/2009	**22:18:40**	262.5	297	77,962	
4/21/2009	**22:19:42**	271.2	297	80,536	
4/21/2009	**22:20:44**	272.7	297	80,986	
4/21/2009	**22:21:54**	253.9	297	75,413	
4/21/2009	**22:23:09**	268.4	297	79,715	
4/21/2009	**22:24:20**	267.6	297	79,464	
4/21/2009	**22:25:23**	257.7	297	76,547	
4/21/2009	**22:26:24**	251.3	297	74,627	
4/21/2009	**22:27:37**	242.6	297	72,042	
4/21/2009	**22:28:39**	254.1	297	75,458	
4/21/2009	**22:29:47**	245.4	297	72,879	
4/21/2009	**22:30:49**	235.3	297	69,897	
4/21/2009	**22:31:51**	232.9	297	69,182	
4/21/2009	**22:32:54**	236.3	297	70,181	
4/21/2009	**22:33:55**	236.0	297	70,082	
4/21/2009	**22:34:58**	228.8	297	67,947	
4/21/2009	**22:36:01**	228.3	297	67,815	
4/21/2009	**22:37:11**	223.3	297	66,323	
4/21/2009	**22:38:13**	230.5	297	68,470	
4/21/2009	**22:39:16**	232.1	297	68,930	
4/21/2009	**22:40:19**	214.9	297	63,831	
4/21/2009	**22:41:21**	213.0	297	63,266	
4/21/2009	**22:42:23**	215.7	297	64,057	
4/21/2009	**22:43:32**	221.0	297	65,632	
4/21/2009	**22:44:35**	223.4	297	66,339	
4/21/2009	**22:45:36**	211.0	297	62,680	
4/21/2009	**22:46:39**	216.8	297	64,397	
4/21/2009	**22:47:41**	202.6	297	60,175	
4/21/2009	**22:48:51**	219.3	297	65,135	
4/21/2009	**22:49:53**	202.4	297	60,105	
4/21/2009	**22:50:55**	200.7	297	59,610	
4/21/2009	**22:51:57**	198.8	297	59,045	
4/21/2009	**22:52:59**	201.0	297	59,692	
4/21/2009	**22:54:02**	191.1	297	56,754	
4/21/2009	**22:55:04**	198.8	297	59,051	
4/21/2009	**22:56:06**	193.7	297	57,537	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	**HF (ppmv)**	**Flow DSCFM**	**HF Surrogate Rate**	**Block Hourly HF Surrogate Rate**
4/21/2009	**22:57:09**	191.8	297	56,961	76,496
4/21/2009	**22:58:12**	189.1	297	56,168	
4/21/2009	**22:59:15**	195.0	297	57,926	
4/21/2009	**23:00:18**	187.4	297	55,660	
4/21/2009	**23:01:19**	194.7	297	57,839	
4/21/2009	**23:02:22**	183.8	297	54,603	
4/21/2009	**23:03:24**	190.2	297	56,497	
4/21/2009	**23:04:26**	191.0	297	56,726	
4/21/2009	**23:05:29**	179.1	297	53,201	
4/21/2009	**23:06:31**	178.5	297	53,027	
4/21/2009	**23:07:34**	185.2	297	55,003	
4/21/2009	**23:08:36**	171.2	297	50,844	
4/21/2009	**23:09:38**	176.0	297	52,277	
4/21/2009	**23:10:45**	167.2	297	49,647	
4/21/2009	**23:11:48**	176.2	297	52,336	
4/21/2009	**23:12:50**	172.4	297	51,209	
4/21/2009	**23:13:53**	172.0	297	51,081	
4/21/2009	**23:14:54**	177.9	297	52,827	
4/21/2009	**23:15:57**	168.1	297	49,935	
4/21/2009	**23:17:00**	164.7	297	48,922	
4/21/2009	**23:18:01**	158.9	297	47,184	
4/21/2009	**23:19:04**	156.5	297	46,467	
4/21/2009	**23:20:07**	168.4	297	50,021	
4/21/2009	**23:21:08**	159.0	297	47,231	
4/21/2009	**23:22:11**	156.1	297	46,357	
4/21/2009	**23:23:14**	143.0	297	42,480	
4/21/2009	**23:24:15**	156.5	297	46,476	
4/21/2009	**23:25:18**	146.2	297	43,430	
4/21/2009	**23:26:20**	147.7	297	43,852	
4/21/2009	**23:27:22**	139.3	297	41,366	
4/21/2009	**23:28:25**	145.2	297	43,135	
4/21/2009	**23:29:28**	151.0	297	44,849	
4/21/2009	**23:30:31**	147.1	297	43,677	
4/21/2009	**23:31:34**	145.7	297	43,273	
4/21/2009	**23:32:36**	142.7	297	42,369	
4/21/2009	**23:33:38**	143.5	297	42,623	
4/21/2009	**23:34:41**	142.1	297	42,190	
4/21/2009	**23:35:42**	143.0	297	42,459	
4/21/2009	**23:36:45**	141.1	297	41,903	
4/21/2009	**23:37:48**	127.5	297	37,858	
4/21/2009	**23:38:49**	134.4	297	39,917	
4/21/2009	**23:39:52**	135.2	297	40,147	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	HF (ppmv)	Flow DSCFM	HF Surrogate Rate	Block Hourly HF Surrogate Rate
4/21/2009	**23:40:55**	144.8	297	43,005	
4/21/2009	**23:41:56**	127.3	297	37,816	
4/21/2009	**23:42:59**	131.3	297	38,987	
4/21/2009	**23:44:02**	129.4	297	38,423	
4/21/2009	**23:45:03**	137.2	297	40,756	
4/21/2009	**23:46:06**	142.2	297	42,237	
4/21/2009	**23:47:08**	128.9	297	38,295	
4/21/2009	**23:48:10**	125.3	297	37,217	
4/21/2009	**23:49:13**	130.1	297	38,640	
4/21/2009	**23:50:15**	127.0	297	37,712	
4/21/2009	**23:51:17**	125.8	297	37,364	
4/21/2009	**23:52:20**	125.8	297	37,357	
4/21/2009	**23:53:22**	128.5	297	38,168	
4/21/2009	**23:54:24**	130.1	297	38,653	
4/21/2009	**23:55:27**	123.3	297	36,607	
4/21/2009	**23:56:29**	126.0	297	37,412	
4/21/2009	**23:57:35**	122.4	297	36,356	
4/21/2009	**23:58:39**	118.5	297	35,196	
4/21/2009	**23:59:40**	124.8	297	37,057	45,038
4/22/2009	**0:00:43**	121.1	297	35,959	
4/22/2009	**0:01:59**	118.0	297	35,058	
4/22/2009	**0:03:04**	132.0	297	39,215	
4/22/2009	**0:04:07**	118.6	297	35,227	
4/22/2009	**0:05:09**	114.5	297	34,013	
4/22/2009	**0:06:11**	116.7	297	34,662	
4/22/2009	**0:07:14**	121.4	297	36,053	
4/22/2009	**0:08:16**	107.7	297	31,977	
4/22/2009	**0:09:19**	110.8	297	32,907	
4/22/2009	**0:10:21**	115.2	297	34,211	
4/22/2009	**0:11:23**	114.5	297	34,008	
4/22/2009	**0:12:25**	93.4	297	27,733	
4/22/2009	**0:13:28**	107.3	297	31,874	
4/22/2009	**0:14:30**	108.1	297	32,119	
4/22/2009	**0:15:32**	93.9	297	27,884	
4/22/2009	**0:16:35**	114.9	297	34,124	
4/22/2009	**0:17:37**	106.2	297	31,535	
4/22/2009	**0:18:39**	109.2	297	32,444	
4/22/2009	**0:19:42**	105.8	297	31,430	
4/22/2009	**0:20:44**	103.0	297	30,583	
4/22/2009	**0:21:46**	90.6	297	26,917	
4/22/2009	**0:22:49**	105.6	297	31,352	
4/22/2009	**0:23:51**	100.3	297	29,804	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	HF (ppmv)	Flow DSCFM	HF Surrogate Rate	Block Hourly HF Surrogate Rate
4/22/2009	**0:24:53**	89.8	297	26,672	
4/22/2009	**0:25:55**	95.3	297	28,299	
4/22/2009	**0:26:58**	100.6	297	29,871	
4/22/2009	**0:28:00**	97.5	297	28,948	
4/22/2009	**0:29:02**	85.5	297	25,396	
4/22/2009	**0:30:05**	92.1	297	27,361	
4/22/2009	**0:31:07**	93.4	297	27,746	
4/22/2009	**0:32:09**	102.4	297	30,417	
4/22/2009	**0:33:12**	89.2	297	26,494	
4/22/2009	**0:34:14**	96.0	297	28,506	
4/22/2009	**0:35:16**	96.7	297	28,712	
4/22/2009	**0:36:19**	81.0	297	24,049	
4/22/2009	**0:37:21**	96.0	297	28,501	
4/22/2009	**0:38:23**	87.6	297	26,006	
4/22/2009	**0:39:26**	92.2	297	27,396	
4/22/2009	**0:40:28**	98.8	297	29,336	
4/22/2009	**0:41:30**	88.2	297	26,192	
4/22/2009	**0:42:33**	83.6	297	24,836	
4/22/2009	**0:43:34**	88.5	297	26,277	
4/22/2009	**0:44:37**	84.1	297	24,969	
4/22/2009	**0:45:40**	89.2	297	26,482	
4/22/2009	**0:46:41**	82.9	297	24,609	
4/22/2009	**0:47:44**	91.8	297	27,275	
4/22/2009	**0:48:47**	78.4	297	23,292	
4/22/2009	**0:49:48**	78.7	297	23,385	
4/22/2009	**0:50:51**	89.0	297	26,436	
4/22/2009	**0:51:54**	90.7	297	26,927	
4/22/2009	**0:52:55**	87.8	297	26,067	
4/22/2009	**0:53:58**	73.2	297	21,728	
4/22/2009	**0:55:00**	83.6	297	24,843	
4/22/2009	**0:56:05**	81.4	297	24,177	
4/22/2009	**0:57:06**	78.5	297	23,319	
4/22/2009	**0:58:12**	88.9	297	26,411	
4/22/2009	**0:59:15**	86.6	297	25,735	
4/22/2009	**1:00:17**	89.2	297	26,502	
4/22/2009	**1:01:19**	82.1	297	24,386	
4/22/2009	**1:02:22**	90.5	297	26,882	28,759
4/22/2009	**1:03:24**	91.5	297	27,167	
4/22/2009	**1:04:26**	76.7	297	22,786	
4/22/2009	**1:05:28**	84.0	297	24,955	
4/22/2009	**1:06:31**	80.4	297	23,874	
4/22/2009	**1:07:33**	83.4	297	24,779	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	HF (ppmv)	Flow DSCFM	HF Surrogate Rate	Block Hourly HF Surrogate Rate
4/22/2009	**1:08:35**	77.4	297	22,975	
4/22/2009	**1:09:38**	80.7	297	23,953	
4/22/2009	**1:10:40**	79.5	297	23,623	
4/22/2009	**1:11:42**	63.2	297	18,778	
4/22/2009	**1:12:45**	77.2	297	22,918	
4/22/2009	**1:13:46**	80.4	297	23,885	
4/22/2009	**1:14:49**	74.8	297	22,206	
4/22/2009	**1:15:52**	68.9	297	20,459	
4/22/2009	**1:16:53**	79.4	297	23,580	
4/22/2009	**1:17:56**	68.0	297	20,190	
4/22/2009	**1:18:59**	75.8	297	22,523	
4/22/2009	**1:20:06**	72.7	297	21,578	
4/22/2009	**1:21:08**	72.9	297	21,657	
4/22/2009	**1:22:10**	75.6	297	22,457	
4/22/2009	**1:23:13**	74.3	297	22,078	
4/22/2009	**1:24:15**	77.4	297	22,996	
4/22/2009	**1:25:18**	69.9	297	20,760	
4/22/2009	**1:26:20**	75.8	297	22,511	
4/22/2009	**1:27:22**	66.9	297	19,859	
4/22/2009	**1:28:24**	67.3	297	19,995	
4/22/2009	**1:29:26**	72.7	297	21,586	
4/22/2009	**1:30:29**	55.5	297	16,487	
4/22/2009	**1:31:32**	52.6	297	15,621	
4/22/2009	**1:32:33**	73.1	297	21,713	
4/22/2009	**1:33:36**	49.2	297	14,608	
4/22/2009	**1:34:39**	64.2	297	19,079	
4/22/2009	**1:35:40**	67.7	297	20,118	
4/22/2009	**1:36:43**	66.2	297	19,650	
4/22/2009	**1:37:45**	71.5	297	21,244	
4/22/2009	**1:38:50**	69.6	297	20,674	
4/22/2009	**1:39:55**	71.2	297	21,139	
4/22/2009	**1:41:46**	75.5	297	22,433	
4/22/2009	**1:42:48**	62.5	297	18,566	
4/22/2009	**1:43:50**	70.8	297	21,017	
4/22/2009	**1:44:59**	70.7	297	21,001	
4/22/2009	**1:46:07**	56.6	297	16,821	
4/22/2009	**1:47:09**	62.4	297	18,547	
4/22/2009	**1:48:11**	64.8	297	19,242	
4/22/2009	**1:49:14**	49.2	297	14,624	
4/22/2009	**1:50:16**	68.1	297	20,220	
4/22/2009	**1:51:18**	61.5	297	18,254	
4/22/2009	**1:52:24**	64.9	297	19,261	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	HF (ppmv)	Flow DSCFM	HF Surrogate Rate	Block Hourly HF Surrogate Rate
4/22/2009	1:53:27	69.3	297	20,596	
4/22/2009	1:54:28	57.1	297	16,949	
4/22/2009	1:55:31	63.8	297	18,941	
4/22/2009	1:56:35	53.9	297	16,021	
4/22/2009	1:57:37	62.3	297	18,501	
4/22/2009	1:58:50	60.3	297	17,903	
4/22/2009	1:59:57	56.2	297	16,692	
4/22/2009	2:00:59	66.0	297	19,607	
4/22/2009	2:02:02	67.7	297	20,105	
4/22/2009	2:04:00	61.7	297	18,330	
4/22/2009	2:05:01	50.5	297	14,995	
4/22/2009	2:06:04	57.3	297	17,005	
4/22/2009	2:07:07	41.8	297	12,425	20,209
4/22/2009	2:08:09	52.5	297	15,599	
4/22/2009	2:09:11	48.9	297	14,524	
4/22/2009	2:10:37	49.3	297	14,653	
4/22/2009	2:11:39	49.9	297	14,809	
4/22/2009	2:12:41	41.8	297	12,417	
4/22/2009	2:13:44	50.1	297	14,885	
4/22/2009	2:14:46	45.0	297	13,378	
4/22/2009	2:15:48	42.1	297	12,510	
4/22/2009	2:16:51	45.5	297	13,521	
4/22/2009	2:18:00	41.2	297	12,245	
4/22/2009	2:19:02	45.7	297	13,563	
4/22/2009	2:20:04	49.4	297	14,677	
4/22/2009	2:21:22	49.4	297	14,662	
4/22/2009	2:22:24	42.5	297	12,628	
4/22/2009	2:23:35	50.9	297	15,123	
4/22/2009	2:24:38	41.9	297	12,447	
4/22/2009	2:25:39	53.8	297	15,986	
4/22/2009	2:26:42	48.7	297	14,471	
4/22/2009	2:27:44	41.1	297	12,221	
4/22/2009	2:28:46	43.7	297	12,969	
4/22/2009	2:29:52	46.4	297	13,771	
4/22/2009	2:30:58	47.1	297	13,989	
4/22/2009	2:32:00	42.4	297	12,604	
4/22/2009	2:33:02	51.4	297	15,274	
4/22/2009	2:34:06	48.8	297	14,495	
4/22/2009	2:35:11	42.3	297	12,549	
4/22/2009	2:36:20	46.1	297	13,692	
4/22/2009	2:37:21	51.3	297	15,234	
4/22/2009	2:38:24	49.7	297	14,755	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	**HF (ppmv)**	**Flow DSCFM**	**HF Surrogate Rate**	**Block Hourly HF Surrogate Rate**
4/22/2009	**2:39:26**	43.2	297	12,835	
4/22/2009	**2:40:28**	43.6	297	12,940	
4/22/2009	**2:41:31**	44.5	297	13,217	
4/22/2009	**2:42:33**	41.6	297	12,344	
4/22/2009	**2:43:38**	44.6	297	13,253	
4/22/2009	**2:44:41**	42.5	297	12,620	
4/22/2009	**2:45:50**	43.1	297	12,797	
4/22/2009	**2:47:04**	43.5	297	12,920	
4/22/2009	**2:48:07**	40.1	297	11,907	
4/22/2009	**2:49:08**	41.8	297	12,403	
4/22/2009	**2:50:11**	46.5	297	13,825	
4/22/2009	**2:51:14**	42.9	297	12,734	
4/22/2009	**2:52:15**	43.9	297	13,043	
4/22/2009	**2:53:29**	40.9	297	12,146	
4/22/2009	**2:54:32**	48.4	297	14,372	
4/22/2009	**2:55:35**	43.2	297	12,840	
4/22/2009	**2:56:37**	44.2	297	13,117	
4/22/2009	**2:57:39**	41.6	297	12,347	
4/22/2009	**2:58:51**	45.8	297	13,603	
4/22/2009	**2:59:54**	46.3	297	13,738	
4/22/2009	**3:00:56**	37.0	297	10,995	
4/22/2009	**3:02:00**	43.9	297	13,037	
4/22/2009	**3:03:02**	45.4	297	13,475	
4/22/2009	**3:04:05**	47.6	297	14,150	
4/22/2009	**3:05:07**	46.3	297	13,741	
4/22/2009	**3:06:25**	48.3	297	14,341	
4/22/2009	**3:07:54**	43.4	297	12,900	
4/22/2009	**3:08:59**	41.7	297	12,380	
4/22/2009	**3:10:27**	31.6	297	9,383	
4/22/2009	**3:11:29**	41.9	297	12,459	
4/22/2009	**3:12:42**	48.8	297	14,497	13,400
4/22/2009	**3:13:44**	37.4	297	11,098	
4/22/2009	**3:15:06**	43.6	297	12,956	
4/22/2009	**3:16:25**	44.4	297	13,195	
4/22/2009	**3:17:28**	42.2	297	12,520	
4/22/2009	**3:18:35**	45.9	297	13,645	
4/22/2009	**3:19:38**	43.2	297	12,839	
4/22/2009	**3:20:40**	39.0	297	11,594	
4/22/2009	**3:21:53**	38.6	297	11,473	
4/22/2009	**3:22:59**	43.2	297	12,829	
4/22/2009	**3:24:13**	42.8	297	12,705	
4/22/2009	**3:25:16**	36.3	297	10,790	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	**HF (ppmv)**	**Flow DSCFM**	**HF Surrogate Rate**	**Block Hourly HF Surrogate Rate**
4/22/2009	**3:26:18**	40.5	297	12,034	
4/22/2009	**3:27:37**	41.4	297	12,296	
4/22/2009	**3:28:40**	44.5	297	13,206	
4/22/2009	**3:29:43**	37.4	297	11,102	
4/22/2009	**3:30:55**	35.6	297	10,586	
4/22/2009	**3:31:59**	41.3	297	12,253	
4/22/2009	**3:33:01**	35.9	297	10,668	
4/22/2009	**3:34:03**	40.2	297	11,937	
4/22/2009	**3:35:06**	39.1	297	11,601	
4/22/2009	**3:36:08**	36.9	297	10,967	
4/22/2009	**3:37:10**	41.7	297	12,371	
4/22/2009	**3:38:12**	39.0	297	11,595	
4/22/2009	**3:39:14**	38.9	297	11,549	
4/22/2009	**3:40:17**	38.6	297	11,455	
4/22/2009	**3:41:41**	38.1	297	11,317	
4/22/2009	**3:42:50**	36.1	297	10,708	
4/22/2009	**3:43:53**	37.9	297	11,251	
4/22/2009	**3:45:08**	35.0	297	10,395	
4/22/2009	**3:46:11**	41.5	297	12,318	
4/22/2009	**3:47:13**	36.7	297	10,895	
4/22/2009	**3:48:15**	42.6	297	12,650	
4/22/2009	**3:49:18**	33.1	297	9,833	
4/22/2009	**3:50:28**	41.4	297	12,302	
4/22/2009	**3:51:30**	35.7	297	10,595	
4/22/2009	**3:52:33**	41.8	297	12,414	
4/22/2009	**3:53:35**	37.7	297	11,185	
4/22/2009	**3:54:37**	36.5	297	10,841	
4/22/2009	**3:55:40**	37.7	297	11,186	
4/22/2009	**3:56:42**	35.0	297	10,404	
4/22/2009	**3:57:44**	42.2	297	12,532	
4/22/2009	**3:58:51**	44.4	297	13,189	
4/22/2009	**3:59:54**	37.3	297	11,082	
4/22/2009	**4:00:56**	38.4	297	11,402	
4/22/2009	**4:02:03**	40.9	297	12,135	
4/22/2009	**4:03:06**	42.8	297	12,716	
4/22/2009	**4:04:17**	36.4	297	10,804	
4/22/2009	**4:05:19**	40.5	297	12,014	
4/22/2009	**4:06:40**	37.2	297	11,059	
4/22/2009	**4:07:42**	38.2	297	11,354	
4/22/2009	**4:08:44**	40.9	297	12,138	
4/22/2009	**4:09:46**	39.2	297	11,642	
4/22/2009	**4:10:52**	40.7	297	12,081	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	HF (ppmv)	Flow DSCFM	HF Surrogate Rate	Block Hourly HF Surrogate Rate
4/22/2009	**4:12:10**	44.4	297	13,176	
4/22/2009	**4:13:12**	36.5	297	10,838	
4/22/2009	**4:14:20**	35.2	297	10,464	
4/22/2009	**4:15:21**	35.2	297	10,444	
4/22/2009	**4:16:24**	36.8	297	10,944	
4/22/2009	**4:17:27**	35.5	297	10,532	
4/22/2009	**4:18:37**	37.9	297	11,254	11,656
4/22/2009	**4:19:43**	37.4	297	11,096	
4/22/2009	**4:20:45**	35.4	297	10,510	
4/22/2009	**4:21:47**	33.8	297	10,034	
4/22/2009	**4:22:50**	30.0	297	8,917	
4/22/2009	**4:23:51**	38.4	297	11,411	
4/22/2009	**4:24:54**	39.3	297	11,681	
4/22/2009	**4:25:57**	39.6	297	11,776	
4/22/2009	**4:26:58**	39.4	297	11,699	
4/22/2009	**4:28:09**	31.1	297	9,227	
4/22/2009	**4:29:18**	39.0	297	11,577	
4/22/2009	**4:30:33**	34.6	297	10,272	
4/22/2009	**4:31:35**	38.7	297	11,503	
4/22/2009	**4:32:44**	31.4	297	9,334	
4/22/2009	**4:33:57**	40.2	297	11,944	
4/22/2009	**4:35:14**	41.0	297	12,174	
4/22/2009	**4:36:23**	34.8	297	10,345	
4/22/2009	**4:37:25**	32.8	297	9,756	
4/22/2009	**4:38:34**	37.7	297	11,189	
4/22/2009	**4:39:36**	37.4	297	11,106	
4/22/2009	**4:40:39**	37.5	297	11,138	
4/22/2009	**4:41:41**	33.5	297	9,953	
4/22/2009	**4:42:50**	35.4	297	10,500	
4/22/2009	**4:43:52**	36.9	297	10,962	
4/22/2009	**4:45:00**	32.9	297	9,778	
4/22/2009	**4:46:12**	36.5	297	10,848	
4/22/2009	**4:47:16**	39.8	297	11,815	
4/22/2009	**4:48:18**	37.4	297	11,118	
4/22/2009	**4:49:21**	31.5	297	9,354	
4/22/2009	**4:50:23**	36.6	297	10,867	
4/22/2009	**4:51:27**	36.3	297	10,788	
4/22/2009	**4:52:32**	39.2	297	11,631	
4/22/2009	**4:53:43**	40.9	297	12,141	
4/22/2009	**4:54:46**	38.0	297	11,285	
4/22/2009	**4:55:47**	40.1	297	11,895	
4/22/2009	**4:56:50**	33.6	297	9,983	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	**HF (ppmv)**	**Flow DSCFM**	**HF Surrogate Rate**	**Block Hourly HF Surrogate Rate**
4/22/2009	**4:57:53**	35.4	297	10,504	
4/22/2009	**4:58:54**	40.2	297	11,953	
4/22/2009	**5:00:09**	35.7	297	10,595	
4/22/2009	**5:01:30**	34.8	297	10,329	
4/22/2009	**5:02:32**	36.9	297	10,947	
4/22/2009	**5:03:35**	37.8	297	11,230	
4/22/2009	**5:04:44**	29.5	297	8,776	
4/22/2009	**5:05:45**	37.9	297	11,263	
4/22/2009	**5:06:48**	37.4	297	11,116	
4/22/2009	**5:07:52**	40.0	297	11,893	
4/22/2009	**5:09:11**	31.0	297	9,218	
4/22/2009	**5:10:13**	39.2	297	11,638	
4/22/2009	**5:11:29**	33.9	297	10,080	
4/22/2009	**5:12:33**	36.8	297	10,943	
4/22/2009	**5:13:35**	40.0	297	11,868	
4/22/2009	**5:14:38**	38.8	297	11,523	
4/22/2009	**5:15:40**	37.0	297	10,978	
4/22/2009	**5:16:43**	35.0	297	10,383	
4/22/2009	**5:17:46**	35.4	297	10,510	
4/22/2009	**5:19:00**	30.0	297	8,902	
4/22/2009	**5:20:11**	35.6	297	10,584	
4/22/2009	**5:21:13**	39.8	297	11,810	
4/22/2009	**5:22:22**	36.5	297	10,844	
4/22/2009	**5:23:28**	34.4	297	10,225	
4/22/2009	**5:24:44**	34.3	297	10,188	10,798
4/22/2009	**5:25:58**	33.7	297	10,022	
4/22/2009	**5:27:00**	32.7	297	9,721	
4/22/2009	**5:28:16**	34.3	297	10,173	
4/22/2009	**5:29:18**	31.3	297	9,296	
4/22/2009	**5:30:40**	32.3	297	9,583	
4/22/2009	**5:31:43**	37.1	297	11,024	
4/22/2009	**5:32:55**	38.4	297	11,405	
4/22/2009	**5:33:58**	38.3	297	11,378	
4/22/2009	**5:35:00**	30.6	297	9,081	
4/22/2009	**5:36:05**	30.5	297	9,071	
4/22/2009	**5:37:08**	33.9	297	10,075	
4/22/2009	**5:38:10**	28.7	297	8,536	
4/22/2009	**5:39:12**	32.5	297	9,648	
4/22/2009	**5:40:15**	38.1	297	11,316	
4/22/2009	**5:41:33**	33.0	297	9,788	
4/22/2009	**5:42:36**	37.9	297	11,259	
4/22/2009	**5:43:39**	35.0	297	10,390	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	**HF (ppmv)**	**Flow DSCFM**	**HF Surrogate Rate**	**Block Hourly HF Surrogate Rate**
4/22/2009	**5:44:58**	36.1	297	10,725	
4/22/2009	**5:46:19**	37.2	297	11,037	
4/22/2009	**5:47:33**	34.1	297	10,141	
4/22/2009	**5:48:39**	39.1	297	11,600	
4/22/2009	**5:49:40**	36.5	297	10,838	
4/22/2009	**5:50:43**	31.6	297	9,389	
4/22/2009	**5:51:46**	33.6	297	9,971	
4/22/2009	**5:52:52**	30.0	297	8,915	
4/22/2009	**5:54:10**	32.9	297	9,758	
4/22/2009	**5:55:12**	32.7	297	9,727	
4/22/2009	**5:56:14**	35.1	297	10,430	
4/22/2009	**5:57:20**	32.5	297	9,643	
4/22/2009	**5:58:23**	33.0	297	9,813	
4/22/2009	**5:59:25**	33.1	297	9,835	
4/22/2009	**6:00:44**	31.4	297	9,333	
4/22/2009	**6:01:46**	34.9	297	10,351	
4/22/2009	**6:03:06**	31.9	297	9,462	
4/22/2009	**6:04:21**	33.9	297	10,079	
4/22/2009	**6:05:24**	30.2	297	8,963	
4/22/2009	**6:06:30**	30.2	297	8,971	
4/22/2009	**6:07:31**	32.7	297	9,708	
4/22/2009	**6:08:36**	31.8	297	9,449	
4/22/2009	**6:09:37**	33.4	297	9,907	
4/22/2009	**6:10:40**	31.3	297	9,307	
4/22/2009	**6:11:43**	31.5	297	9,353	
4/22/2009	**6:12:48**	30.1	297	8,927	
4/22/2009	**6:13:50**	34.4	297	10,205	
4/22/2009	**6:14:53**	33.9	297	10,060	
4/22/2009	**6:15:55**	34.7	297	10,314	
4/22/2009	**6:17:00**	28.5	297	8,468	
4/22/2009	**6:18:03**	28.9	297	8,569	
4/22/2009	**6:19:05**	30.2	297	8,964	
4/22/2009	**6:20:16**	33.1	297	9,817	
4/22/2009	**6:21:28**	32.9	297	9,763	
4/22/2009	**6:22:49**	34.6	297	10,265	
4/22/2009	**6:23:53**	29.3	297	8,714	
4/22/2009	**6:24:55**	30.7	297	9,122	
4/22/2009	**6:26:11**	32.4	297	9,608	
4/22/2009	**6:27:13**	32.3	297	9,589	
4/22/2009	**6:28:21**	29.8	297	8,844	
4/22/2009	**6:29:24**	33.1	297	9,843	
4/22/2009	**6:30:28**	27.3	297	8,116	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	HF (ppmv)	Flow DSCFM	HF Surrogate Rate	Block Hourly HF Surrogate Rate
4/22/2009	**6:31:29**	32.6	297	9,690	9,789
4/22/2009	**6:32:31**	36.4	297	10,819	
4/22/2009	**6:33:40**	34.7	297	10,299	
4/22/2009	**6:34:43**	28.9	297	8,570	
4/22/2009	**6:35:45**	37.6	297	11,160	
4/22/2009	**6:36:48**	31.1	297	9,225	
4/22/2009	**6:37:50**	29.4	297	8,720	
4/22/2009	**6:38:57**	29.8	297	8,862	
4/22/2009	**6:40:00**	28.8	297	8,546	
4/22/2009	**6:41:01**	31.8	297	9,443	
4/22/2009	**6:42:04**	30.3	297	8,987	
4/22/2009	**6:43:07**	35.4	297	10,528	
4/22/2009	**6:44:08**	35.3	297	10,474	
4/22/2009	**6:45:19**	31.7	297	9,402	
4/22/2009	**6:46:22**	34.7	297	10,298	
4/22/2009	**6:47:27**	29.9	297	8,874	
4/22/2009	**6:48:30**	31.5	297	9,342	
4/22/2009	**6:49:32**	36.9	297	10,970	
4/22/2009	**6:50:34**	30.3	297	9,010	
4/22/2009	**6:51:47**	28.0	297	8,322	
4/22/2009	**6:52:51**	30.9	297	9,189	
4/22/2009	**6:53:54**	33.5	297	9,946	
4/22/2009	**6:54:57**	30.3	297	9,003	
4/22/2009	**6:55:59**	33.0	297	9,813	
4/22/2009	**6:57:02**	28.2	297	8,363	
4/22/2009	**6:58:03**	28.5	297	8,469	
4/22/2009	**6:59:06**	30.6	297	9,078	
4/22/2009	**7:00:08**	27.3	297	8,122	
4/22/2009	**7:01:10**	29.7	297	8,833	
4/22/2009	**7:02:13**	26.2	297	7,779	
4/22/2009	**7:03:16**	28.5	297	8,452	
4/22/2009	**7:04:19**	27.8	297	8,246	
4/22/2009	**7:05:21**	26.8	297	7,945	
4/22/2009	**7:06:23**	24.8	297	7,352	
4/22/2009	**7:07:26**	24.3	297	7,204	
4/22/2009	**7:08:28**	27.4	297	8,148	
4/22/2009	**7:09:30**	24.7	297	7,332	
4/22/2009	**7:10:33**	26.0	297	7,712	
4/22/2009	**7:11:35**	26.7	297	7,934	
4/22/2009	**7:12:38**	27.0	297	8,034	
4/22/2009	**7:13:39**	27.4	297	8,139	
4/22/2009	**7:14:42**	28.4	297	8,425	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	HF (ppmv)	Flow DSCFM	HF Surrogate Rate	Block Hourly HF Surrogate Rate
4/22/2009	**7:15:44**	27.9	297	8,276	
4/22/2009	**7:16:46**	29.7	297	8,812	
4/22/2009	**7:17:49**	24.9	297	7,408	
4/22/2009	**7:18:51**	25.6	297	7,601	
4/22/2009	**7:19:53**	28.0	297	8,309	
4/22/2009	**7:20:56**	22.6	297	6,709	
4/22/2009	**7:21:58**	28.9	297	8,589	
4/22/2009	**7:23:00**	31.2	297	9,264	
4/22/2009	**7:24:03**	23.5	297	6,992	
4/22/2009	**7:25:05**	22.1	297	6,574	
4/22/2009	**7:26:07**	27.7	297	8,217	
4/22/2009	**7:27:10**	30.2	297	8,958	
4/22/2009	**7:28:11**	29.9	297	8,884	
4/22/2009	**7:29:14**	21.7	297	6,438	
4/22/2009	**7:30:17**	22.6	297	6,723	
4/22/2009	**7:31:19**	23.8	297	7,056	
4/22/2009	**7:32:21**	28.1	297	8,346	
4/22/2009	**7:33:24**	22.5	297	6,675	
4/22/2009	**7:34:25**	22.7	297	6,753	8,533
4/22/2009	**7:35:28**	26.9	297	7,979	
4/22/2009	**7:36:30**	23.8	297	7,077	
4/22/2009	**7:37:32**	25.9	297	7,701	
4/22/2009	**7:38:35**	20.7	297	6,161	
4/22/2009	**7:39:37**	22.7	297	6,744	
4/22/2009	**7:40:39**	20.0	297	5,939	
4/22/2009	**7:41:42**	22.9	297	6,800	
4/22/2009	**7:42:44**	23.8	297	7,073	
4/22/2009	**7:43:46**	23.2	297	6,879	
4/22/2009	**7:44:48**	21.9	297	6,512	
4/22/2009	**7:45:51**	22.7	297	6,754	
4/22/2009	**7:46:53**	21.9	297	6,511	
4/22/2009	**7:47:55**	25.5	297	7,575	
4/22/2009	**7:48:58**	25.0	297	7,429	
4/22/2009	**7:50:00**	24.3	297	7,205	
4/22/2009	**7:51:02**	22.0	297	6,545	
4/22/2009	**7:52:06**	21.2	297	6,298	
4/22/2009	**7:53:08**	25.4	297	7,556	
4/22/2009	**7:54:13**	23.3	297	6,916	
4/22/2009	**7:55:17**	22.4	297	6,663	
4/22/2009	**7:56:18**	25.0	297	7,416	
4/22/2009	**7:57:21**	20.9	297	6,212	
4/22/2009	**7:58:24**	24.1	297	7,166	

RAW DATA for Oven HF Concentration and Flow Rate Profile

Date	Time	HF (ppmv)	Flow DSCFM	HF Surrogate Rate	Block Hourly HF Surrogate Rate
4/22/2009	**7:59:25**	22.7	297	6,743	
4/22/2009	**8:00:28**	21.0	297	6,231	
4/22/2009	**8:01:31**	22.6	297	6,717	
4/22/2009	**8:02:32**	19.7	297	5,860	
4/22/2009	**8:03:35**	24.3	297	7,227	
4/22/2009	**8:04:37**	21.0	297	6,226	
4/22/2009	**8:05:39**	18.5	297	5,494	
4/22/2009	**8:06:42**	9.0	297	2,676	
4/22/2009	**8:07:44**	6.1	297	1,810	
4/22/2009	**8:08:46**	3.8	297	1,121	
4/22/2009	**8:09:49**	4.5	297	1,351	
4/22/2009	**8:10:51**	4.7	297	1,404	
4/22/2009	**8:11:55**	2.5	297	756	
4/22/2009	**8:13:00**	4.2	297	1,255	
4/22/2009	**8:14:14**	3.0	297	895	
4/22/2009	**8:15:25**	3.2	297	937	
4/22/2009	**8:16:28**	2.5	297	733	
4/22/2009	**8:17:30**	3.1	297	933	
4/22/2009	**8:18:32**	3.0	297	888	5,199

ANALYSIS

Hour Block	Approximate Duration (hr)	Surrogate Emission Rate Indicator (ppmv x DSCFM)	Percent of the Maximum Emission Rate
Hour 1	1.00	4,675	3%
Hour 2	1.00	135,229	100%
Hour 3	1.00	128,790	95%
Hour 4	1.00	76,496	57%
Hour 5	1.00	45,038	33%
Hour 6	1.00	28,759	21%
Hour 7	1.00	20,209	15%
Hour 8	1.00	13,400	10%
Hour 9	1.00	11,656	9%
Hour 10	1.00	10,798	8%
Hour 11	1.00	9,789	7%
Hour 12	1.00	8,533	6%
Hour 13	0.70	5,199	4%
			0%
Total -->	12.70	135,229 (Maximum)	369%

HF Oven Emission Profile

Evaluations made from oven hydrogen fluoride (HF) emission profile was produced from data collected on April 21, 2009 at the Henderson site.

One minute of uncontrolled HF emission concentrations were measured continuously from an oven during its baking phase. Corresponding exhaust flow rates were also measured for each emission concentration.

Each HF concentration data collected in ppmv and corresponding exhaust flow in dscfm was multiplied to provide a product for a surrogate emission rate (mass/time). This value is not in a relatable unit of measure for reporting purposes; however, it would be directly proportional to one and can be derived using conversion factors.

AECOM

AECOM Technical Services, Inc.
Suite 200
Raleigh, North Carolina 27607

919.461.1100 tel
919.461.1415 fax

November 11, 2025

Re: Summary of Results for Permit F-16-012 R1 Scrubber System Diagnostic Stack Testing

Dear Mr. Chesnut,

This letter contains the results of the Hydrogen Fluoride engineering testing conducted by AECOM Technical Services, Inc. (AECOM) on the acid gas scrubber system controlling air emissions from the ovens at Shamrock Technologies' Henderson, KY facility.

Objective:

The objective of the study was to quantify hydrogen fluoride (HF) emissions from the inlet and outlet of the Oven scrubber system at Shamrock Technologies, Inc. located at 301 Community Drive facility in Henderson, KY and determine the HF removal efficiency of this scrubber. Two tests were performed on the oven scrubber, to independently measure the scrubber performance when processing two different product feed streams. The testing demonstrations used worst case operating scenarios as may be required for future permit compliance testing.

Process Description:

The emission testing locations were located at the inlet and outlet of the oven scrubber system. The scrubber system tested was the oven scrubber (Scrubber 1) controlling Blue Tray Oven 1, Tray Oven 2, Tray Oven 3, and Tray Oven 4 (permit emission units D9, D11, D12, and D13, respectively).

Testing Procedure:

An AECOM test team consisting of Charlie Thompson, Jeff Aims, Chris Trevillian, and Jialuo Yu conducted the testing for velocity, moisture, O_2, CO_2, and HF. AECOM concurrently sampled gas from the inlet and outlet of the scrubber unit using U.S. EPA Method 26A. Tests were conducted at two test conditions at Scrubber 1. Each test condition consisted of three (3) sampling runs.

U.S. EPA Methods 1-4 and 26A procedures were followed along with AECOM's internal QA/QC practices including peer review following quality assurance parameters. The inlet duct as well as the outlet duct were sampled isokinetically across two diameters per U.S. EPA Method 1.

At each location, an integrated sample of the stack gas was collected in Tedlar bags and was analyzed using U.S. EPA Method 3A to determine O_2 and CO_2 concentrations for use in calculating molecular weight. HF samples were recovered on site and collected in sample containers. Each sample was transported back to AECOM's Morrisville, NC location for transport to the analytical laboratory. Equipment calibrations and QA/QC information can be found in Attachments C and D.

Results:

The test run times for the engineering study are illustrated in Table 1. Table 2 summarizes the measured HF mass emission rates and calculated removal efficiency for each set of tests. Table 3 is a summary of the outlet emission rates, which will be useful input for emission modeling. One test run at the Oven (Scrubber 1) under Condition 1 was below 90% removal efficiency, but the average of the three runs at that condition was greater than 90%.

Table 1. Schedule of Testing – March 2025

Source	Run	Date	Start Time	End Time
Oven Scrubber – Condition One	1	3/27/2025	08:35	09:28
	2		09:44	10:37
	3		10:54	11:46
Oven Scrubber – Condition Two	1	3/28/2025	07:51	08:47
	2		09:06	10:01
	3		10:17	11:12

Table 2. Summary of HF Removal Efficiency

Source	Run	Inlet (lbs/hr)	Outlet (lbs/hr)	Removal Efficiency (%)	Title V Requirement (%)
Oven Scrubber – Condition One	1	0.022	0.005	77.6%	90
	2	0.053	0.005	91.1%	
	3	0.185	0.006	97.0%	
	Average	**0.087**	**0.005**	**94.1%**	
Oven Scrubber – Condition Two	1	2.72	0.036	98.7%	
	2	2.57	0.030	98.8%	
	3	2.69	0.027	99.0%	
	Average	**2.66**	**0.031**	**98.8%**	

Table 3. Outlet Modeling Inputs

Source	Run	Outlet Parameters			
		Velocity (ft/sec)	HF Concentration (g/dscf)	Stack Temperature (°F)	Stack Volumetric Flow (dscfm)
Oven Scrubber – Condition One	1	34.35	7.48E-06	53	5,023
	2	35.25	6.90E-06	55	5,157
	3	36.72	7.99E-06	60	5,312
	Average	**35.44**	**7.46E-06**	**56**	**5,164**
Oven Scrubber – Condition Two	1	35.21	5.25E-05	68	4,995
	2	35.72	4.31E-05	75	4,968
	3	34.76	4.03E-05	81	4,775
	Average	**35.23**	**4.53E-05**	**74**	**4,913**

If you have any questions regarding this demonstration or the results that were obtained, please feel free to contact Charlie Thompson (412-841-2957).

Sincerely,

Charles Thompson

Charlie Thompson PE, QSTI
Project Manager, Air Measurements

(Enclosures)

Attachment A – Test Results
Attachment B – Raw Field Data
Attachment C – Equipment Calibrations
Attachment D – Quality Assurance and Quality Control

Attachment A

Test Results

Scrubber 1 - Oven HF Control Efficiency - Condition One

HF Engineering
March 27, 2025

Source	Run #	HF (lb/hr)
Oven Inlet	1	0.022
	2	0.053
	3	0.185
	Average:	**0.087**
Oven Outlet	1	0.005
	2	0.005
	3	0.006
	Average:	**0.005**
Oven Control Efficiency	1	77.6%
	2	91.1%
	3	97.0%
	Average:	**94.1%**

Scrubber 1 - Oven HF Control Efficiency - Condition Two

HF Engineering
March 28, 2025

Source	Run #	HF (lb/hr)
Oven Inlet	1	2.72
	2	2.57
	3	2.69
	Average:	**2.66**
Oven Outlet	1	0.036
	2	0.030
	3	0.027
	Average:	**0.031**
Oven Control Efficiency	1	98.7%
	2	98.8%
	3	99.0%
	Average:	**98.8%**

Shamrock HF Study
OVEN Inlet **COND 1**
26A
Emission Calculations

Pollutant: **Hydrogen Fluoride**

Run	Date	Time	Total HF Catch (mg)	Sample Volume (dscf)	HF Concentration (g/dscf)	Flow Rate (dscfm)	HF Emissions (lb/hr)
1	3/27/2025	08:35-09:28	2.69	32.340	8.32E-05	2,018	0.022
2	3/27/2025	09:44-10:37	6.48	37.355	1.73E-04	2,296	0.053
3	3/27/2025	10:54-11:46	23.0	43.819	5.25E-04	2,664	0.18
AVERAGE			**10.72**	**37.838**	**2.61E-04**	**2,326**	**0.087**

Calculation Summary

Project Name	**Shamrock HF Study**
Project Number	**60751134**
Facility	**HENDERSON, KY**

Sample Type	26A	26A	26A	Averages
Source	OVEN Inlet	OVEN Inlet	OVEN Inlet	
Condition	COND 1	COND 1	COND 1	
Run	1	2	3	
Date	3/27/2025	3/27/2025	3/27/2025	
Time Start	8:35	9:44	10:54	
Time Stop	9:28	10:37	11:46	
Sampling Times	08:35-09:28	09:44-10:37	10:54-11:46	
Duct Diameter (ft) *(equivalent if square duct)*	1.42	1.42	1.42	
Pitot Tube Correction Factor	0.84	0.84	0.84	
Nozzle Diameter (inches)	0.314	0.314	0.314	
DGMCF (Y_d)	1.007	1.007	1.007	
Orifice Factor ("wc) ($\Delta H_@$)	1.765	1.765	1.765	
Console Identification	SC-M1540	SC-M1540	SC-M1540	
Standard Temperature (°F) (T_{std})	68	68	68	
Barometric Pressure Measured ("Hg)	29.78	29.78	29.78	
Stack Elevation (ft) (relative to Barometer)	0	0	0	
Barometric Pressure ("Hg) (P_{bar})	29.78	29.78	29.78	
Average Stack Temperature (°F) (T_S)	78.3	92.3	110.9	93.8
Average DGM Temp (°F) (T_m)	55.3	59.8	61.1	
Average Delta H ("wc) (ΔH_{avg})	1.64	2.15	2.93	
Condensed Water (g)	7.5	6.8	8.2	
Test Duration (minutes) (Θ)	48	48	48	
Static Pressure ("wc) (P_g)	-6.50	-6.50	-6.50	
Carbon Monoxide Content (%) (%CO)	0	0	0	
Carbon Dioxide Content (%) (%CO_2)	0.13	0.13	0.11	
Oxygen Content (%) (%O_2)	20.88	20.74	20.75	
Hydrogen Content (%) (%H_2)	0.0	0.0	0.0	
Methane Content (%) (%CH_4)	0.0	0.0	0.0	
Nitrogen Content (%) (%N_2)	78.99	79.13	79.14	
Meter Volume (dcf) (V_m)	31.364	36.499	42.836	
Average square root of ΔP ($(\sqrt{\Delta P})_{avg}$)	0.391	0.450	0.531	
Absolute Stack Pressure ("Hg) (P_S)	29.30	29.30	29.30	
Absolute Stack Temperature (°R) (T_S)	537.9	552.0	570.6	553.5
Flue Gas Moisture (%) (B_{WS})	1.08	0.85	0.87	0.94
Moisture at saturation	3.32	5.15	9.00	
Moisture used in Calculation	1.08	0.85	0.87	0.94
Gas Molecular Wt (Wet) (g/g-mole) (M_S)	28.74	28.76	28.75	
Corrected Vol of Gas Sample (dcf) ($V_{m(actual)}$)	31.584	36.754	43.136	
Volume at Meter (dscf) (V_M)	32.340	37.355	43.819	
Average Gas Velocity (ft/sec) (V_S)	22.45	26.16	31.38	26.66
Avg Flow Rate (acfh)	127,388	148,443	178,050	151,294
Avg Flow Rate (acfm)	2,123	2,474	2,968	2,522
Avg Flow Rate (scfh)	122,380	138,969	161,257	140,869
Avg Flow Rate (scfm)	2,040	2,316	2,688	2,348
Avg Flow Rate (dscfh) (Q_{sd})	121,056	137,786	159,847	139,563
Avg Flow Rate (dscfm) (Q_{sd})	2,018	2,296	2,664	2,326
Isokinetic Sampling Rate (%) (I)	97.88	99.33	100.44	

Calculation Summary

Data Entry Area

Sample Type	26A	Pitot Tube Correction Factor	0.84
Source	OVEN Inlet	Console ID	SC-M1540
Condition	COND 1	DGMCF	1.007
Run	1	$\Delta H_@$	1.765
Date	27-Mar	Nozzle Diameter (in)	0.314
Duct Diameter (ft)	1.42	Std Temp (°F)	68
Duct Depth (ft)		Bar Press ("Hg, meas)	29.78
Duct Width (ft)		Meter Elev (ft) (rel to Brmtr)	0
		Static Press ("H_2O)	-6.5

Entered By (initials)	***CJT***	
Checked by (initials)	***CMT***	
Corrected by (initials)	***CMT***	
	Value	Link Checked
% CO		
% CO_2	0.13	
% O_2	20.88	
% H_2		
% CH_4		

Times		**DGM Volumes** (as read)	
start	8:35	start	663.295
stop	8:59	stop	679.186
start	9:04	start	679.186
stop	9:28	stop	694.659
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
Duration	48	Total	31.364

Impinger Catch (g)

	Initial	Final	
1	749.6	750.0	0.4
2	723.1	723.6	0.5
3	598.1	599.2	1.1
4	833.9	839.4	5.5
5			--
6			--
7			--
8			--
9			--
10			--
		Total Wt Gain	7.5

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	√ΔP	√ΔH
Averages	0.16	1.64	78	55.3	0.3911	1.2666
Individual Readings	0.08	0.83	77	54	0.28284271	0.91104336
	0.13	1.40	79	53	0.36055513	1.18321596
	0.15	1.60	81	53	0.38729833	1.26491106
	0.15	1.60	84	54	0.38729833	1.26491106
	0.26	2.70	81	54	0.50990195	1.64316767
	0.20	2.10	83	55	0.4472136	1.44913767
	0.12	1.20	84	56	0.34641016	1.09544512
	0.14	1.50	90	57	0.37416574	1.22474487
	0.15	1.60	89	57	0.38729833	1.26491106
	0.20	2.10	66	57	0.4472136	1.44913767
	0.20	2.10	65	57	0.4472136	1.44913767
	0.10	1.00	60	57	0.31622777	1

Calculation Summary

Data Entry Area

Sample Type	26A	Pitot Tube Correction Factor	0.84	Entered By (initials)		**CJT**
Source	OVEN Inlet	Console ID	SC-M1540	Checked by (initials)		**CMT**
Condition	COND 1	DGMCF	1.007	Corrected by (initials)		**CMT**
Run	2	$\Delta H_@$	1.765		Value	Link Checked
Date	27-Mar	Nozzle Diameter (in)	0.314	% CO		
Duct Diameter (ft)	1.42	Std Temp (°F)	68	% CO_2	0.13	
Duct Depth (ft)		Bar Press ("Hg, meas)	29.78	% O_2	20.74	
Duct Width (ft)		Meter Elev (ft) (rel to Brmtr)	0	% H_2		
		Static Press ("H_2O)	-6.5	% CH_4		

Times		**DGM Volumes** (as read)		**Impinger Catch (g)**			
					Initial	Final	
start	9:44	start	694.815				
stop	10:08	stop	714.087	1	720.9	721.5	0.6
start	10:13	start	714.087	2	754.9	755.2	0.3
stop	10:37	stop	731.314	3	653.3	654.3	1
start		start		4	881.2	886.1	4.9
stop		stop		5			--
start		start		6			--
stop		stop		7			--
start		start		8			--
stop		stop		9			--
start		start		10			--
stop		stop					
start		start					
stop		stop					
start		start					
stop		stop					
start		start					
stop		stop					
						Total Wt Gain	6.8
Duration	48	Total	36.499				

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	√ΔP	√ΔH
Averages	0.21	2.15	92	59.8	0.4501	1.4583
Individual Readings	0.18	1.90	90	59	0.42426407	1.378404875
	0.20	2.10	92	59	0.4472136	1.449137675
	0.23	2.40	94	59	0.47958315	1.549193338
	0.23	2.40	85	59	0.47958315	1.549193338
	0.18	1.90	74	60	0.42426407	1.378404875
	0.35	3.60	77	60	0.59160798	1.897366596
	0.15	1.60	91	60	0.38729833	1.264911064
	0.18	1.90	101	60	0.42426407	1.378404875
	0.20	2.10	98	60	0.4472136	1.449137675
	0.20	2.10	101	60	0.4472136	1.449137675
	0.18	1.90	102	61	0.42426407	1.378404875
	0.18	1.90	103	61	0.42426407	1.378404875

Calculation Summary

Data Entry Area

Sample Type	26A	Pitot Tube Correction Factor	0.84	Entered By (initials)		***CJT***
Source	OVEN Inlet	Console ID	SC-M1540	Checked by (initials)		***CMT***
Condition	COND 1	DGMCF	1.007	Corrected by (initials)		***CMT***
Run	3	$\Delta H_@$	1.765		Value	Link Checked
Date	27-Mar	Nozzle Diameter (in)	0.314	% CO		
Duct Diameter (ft)	1.42	Std Temp (°F)	68	% CO_2	0.11	
Duct Depth (ft)		Bar Press ("Hg, meas)	29.78	% O_2	20.75	
Duct Width (ft)		Meter Elev (ft) (rel to Brmtr)	0	% H_2		
		Static Press ("H_2O)	-6.5	% CH_4		

Times		**DGM Volumes** (as read)		**Impinger Catch (g)**			
start	10:54	start	731.445		Initial	Final	
stop	11:18	stop	753.733	1	740.0	737.9	-2.1
start	11:22	start	753.733	2	768.5	769.0	0.5
stop	11:46	stop	774.281	3	669.5	671.1	1.6
start		start		4	867.6	875.8	8.2
stop		stop		5			--
start		start		6			--
stop		stop		7			--
start		start		8			--
stop		stop		9			--
start		start		10			--
stop		stop					
start		start					
stop		stop					
start		start					
stop		stop					
start		start					
stop		stop					
						Total Wt Gain	8.2
Duration	48	Total	42.836				

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	√ΔP	√ΔH
Averages	0.28	2.93	111	61.1	0.5309	1.7087
Individual Readings	0.25	2.60	107	60	0.5	1.61245155
	0.30	3.10	110	60	0.54772256	1.76068169
	0.32	3.30	111	61	0.56568542	1.81659021
	0.32	3.30	111	61	0.56568542	1.81659021
	0.29	3.00	111	61	0.53851648	1.73205081
	0.36	3.70	114	61	0.6	1.92353841
	0.21	2.20	108	61	0.45825757	1.4832397
	0.25	2.60	120	61	0.5	1.61245155
	0.30	3.10	120	61	0.54772256	1.76068169
	0.30	3.10	119	62	0.54772256	1.76068169
	0.25	2.60	105	62	0.5	1.61245155
	0.25	2.60	95	62	0.5	1.61245155

Shamrock HF Study
OVEN Outlet **COND 1**
26A
Emission Calculations

Pollutant: **Hydrogen Fluoride**

Run	Date	Time	Total HF Catch (mg)	Sample Volume (dscf)	HF Concentration (g/dscf)	Flow Rate (dscfm)	HF Emissions (lb/hr)
1	3/27/2025	08:35-09:28	0.203	27.127	7.48E-06	5,023	0.0050
2	3/27/2025	09:44-10:37	0.192	27.818	6.90E-06	5,157	0.0047
3	3/27/2025	10:54-11:46	0.228	28.535	7.99E-06	5,312	0.0056
AVERAGE			**0.208**	**27.827**	**7.46E-06**	**5,164**	**0.0051**

Calculation Summary

Project Name	**Shamrock HF Study**
Project Number	**60751134**
Facility	**Henderson, KY**

Sample Type	26A	26A	26A	Averages
Source	OVEN Outlet	OVEN Outlet	OVEN Outlet	
Condition	COND 1	COND 1	COND 1	
Run	1	2	3	
Date	3/27/2025	3/27/2025	3/27/2025	
Time Start	8:35	9:44	10:54	
Time Stop	9:28	10:37	11:46	
Sampling Times	08:35-09:28	09:44-10:37	10:54-11:46	
Duct Diameter (ft) *(equivalent if square duct)*	1.75	1.75	1.75	
Pitot Tube Correction Factor	0.84	0.84	0.84	
Nozzle Diameter (inches)	0.218	0.218	0.218	
DGMCF (Y_d)	0.972	0.972	0.972	
Orifice Factor ("wc) ($\Delta H_@$)	1.886	1.886	1.886	
Console Identification	SC-M1533	SC-M1533	SC-M1533	
Standard Temperature (°F) (T_{std})	68	68	68	
Barometric Pressure Measured ("Hg)	29.78	29.80	29.80	
Stack Elevation (ft) (relative to Barometer)	0	0	0	
Barometric Pressure ("Hg) (P_{bar})	29.78	29.8	29.8	
Average Stack Temperature (°F) (T_S)	53.2	54.8	60.3	56.1
Average DGM Temp (°F) (T_m)	51.4	55.4	56.8	
Average Delta H ("wc) (ΔH_{avg})	1.02	1.07	1.15	
Condensed Water (g)	8.3	7.5	8.2	
Test Duration (minutes) (Θ)	48	48	48	
Static Pressure ("wc) (P_g)	1.50	2.00	2.10	
Carbon Monoxide Content (%) (%CO)	0	0	0	
Carbon Dioxide Content (%) (%CO_2)	0.16	0.13	0.11	
Oxygen Content (%) (%O_2)	20.77	20.75	20.74	
Hydrogen Content (%) (%H_2)	0.0	0.0	0.0	
Methane Content (%) (%CH_4)	0.0	0.0	0.0	
Nitrogen Content (%) (%N_2)	79.07	79.12	79.15	
Meter Volume (dcf) (V_m)	27.090	27.975	28.770	
Average square root of ΔP ($(\sqrt{\Delta P})_{avg}$)	0.619	0.635	0.658	
Absolute Stack Pressure ("Hg) (P_S)	29.89	29.95	29.95	
Absolute Stack Temperature (°R) (T_S)	512.8	514.4	520.0	515.8
Flue Gas Moisture (%) (B_{WS})	1.42	1.26	1.34	1.34
Moisture at saturation	1.86	1.88	2.03	
Moisture used in Calculation	1.42	1.26	1.34	1.34
Gas Molecular Wt (Wet) (g/g-mole) (M_S)	28.70	28.71	28.70	
Corrected Vol of Gas Sample (dcf) ($V_{m(actual)}$)	26.331	27.192	27.964	
Volume at Meter (dscf) (V_M)	27.127	27.818	28.535	
Average Gas Velocity (ft/sec) (V_S)	34.35	35.25	36.72	35.44
Avg Flow Rate (acfh)	297,444	305,196	318,000	306,880
Avg Flow Rate (acfm)	4,957	5,087	5,300	5,115
Avg Flow Rate (scfh)	305,744	313,340	323,059	314,047
Avg Flow Rate (scfm)	5,096	5,222	5,384	5,234
Avg Flow Rate (dscfh) (Q_{sd})	301,395	309,406	318,740	309,847
Avg Flow Rate (dscfm) (Q_{sd})	5,023	5,157	5,312	5,164
Isokinetic Sampling Rate (%) (I)	104.40	104.29	103.84	

Calculation Summary

Data Entry Area

Sample Type	26A	Pitot Tube Correction Factor	0.84	Entered By (initials)	***CJT***	
Source	OVEN Outlet	Console ID	SC-M1533	Checked by (initials)	***CMT***	
Condition	COND 1	DGMCF	0.972	Corrected by (initials)	***CMT***	
Run	1	$\Delta H_@$	1.886		Value	Link Checked
Date	27-Mar	Nozzle Diameter (in)	0.218	% CO		
Duct Diameter (ft)	1.75	Std Temp (°F)	68	% CO_2	0.16	
Duct Depth (ft)		Bar Press ("Hg, meas)	29.78	% O_2	20.77	
Duct Width (ft)		Meter Elev (ft) (rel to Brmtr)	0	% H_2		
		Static Press ("H_2O)	1.5	% CH_4		

Times	
start	8:35
stop	8:59
start	9:04
stop	9:28
start	
stop	
start	
stop	
start	
stop	
start	
stop	
start	
stop	
start	
stop	
start	
stop	
Duration	48

DGM Volumes (as read)	
start	348.800
stop	362.388
start	362.388
stop	375.890
start	
stop	
start	
stop	
start	
stop	
start	
stop	
start	
stop	
start	
stop	
start	
stop	
Total	27.090

Impinger Catch (g)

	Initial	Final	
1	694.9	696.5	1.6
2	694.8	695.9	1.1
3	661.7	662.2	0.5
4	843.7	848.8	5.1
5			--
6			--
7			--
8			--
9			--
10			--
		Total Wt Gain	8.3

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	√ΔP	√ΔH
Averages	0.38	1.02	53	51.4	0.6187	1.0089
Individual	0.37	0.98	52	49	0.60827625	0.98994949
Readings	0.35	0.93	52	49	0.59160798	0.96436508
	0.36	0.96	53	50	0.6	0.9797959
	0.40	1.06	53	50	0.63245553	1.02956301
	0.48	1.28	53	51	0.69282032	1.13137085
	0.37	0.98	53	51	0.60827625	0.98994949
	0.39	1.04	54	52	0.6244998	1.0198039
	0.36	0.96	55	53	0.6	0.9797959
	0.38	1.01	54	53	0.6164414	1.00498756
	0.42	1.12	53	53	0.64807407	1.05830052
	0.44	1.17	53	53	0.66332496	1.08166538
	0.29	0.77	53	53	0.53851648	0.87749644

Calculation Summary

Data Entry Area

Sample Type	26A	Pitot Tube Correction Factor	0.84	Entered By (initials)	***CJT***	
Source	OVEN Outlet	Console ID	SC-M1533	Checked by (initials)	***CMT***	
Condition	COND 1	DGMCF	0.972	Corrected by (initials)	***CMT***	
Run	2	$\Delta H_@$	1.886		Value	Link Checked
Date	27-Mar	Nozzle Diameter (in)	0.218	% CO		
Duct Diameter (ft)	1.75	Std Temp (°F)	68	% CO_2	0.13	
Duct Depth (ft)		Bar Press ("Hg, meas)	29.8	% O_2	20.75	
Duct Width (ft)		Meter Elev (ft) (rel to Brmtr)	0	% H_2		
		Static Press ("H_2O)	2	% CH_4		

Times		**DGM Volumes** (as read)		**Impinger Catch (g)**			
start	9:44	start	376.200		Initial	Final	
stop	10:08	stop	390.433	1	687.9	689.4	1.5
start	10:13	start	390.433	2	734.9	735.5	0.6
stop	10:37	stop	404.175	3	640.2	640.4	0.2
start		start		4	846.0	851.2	5.2
stop		stop		5			--
start		start		6			--
stop		stop		7			--
start		start		8			--
stop		stop		9			--
start		start		10			--
stop		stop					
start		start					
stop		stop					
start		start					
stop		stop					
start		start					
stop		stop					
						Total Wt Gain	7.5
Duration	48	Total	27.975				

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	√ΔP	√ΔH
Averages	0.40	1.07	55	55.4	0.6346	1.0347
Individual Readings	0.41	1.09	55	55	0.64031242	1.044030651
	0.45	1.20	55	54	0.67082039	1.095445115
	0.42	1.12	55	55	0.64807407	1.058300524
	0.42	1.12	54	55	0.64807407	1.058300524
	0.45	1.20	55	55	0.67082039	1.095445115
	0.35	0.93	54	55	0.59160798	0.964365076
	0.37	0.98	55	56	0.60827625	0.989949494
	0.38	1.01	55	56	0.6164414	1.004987562
	0.40	1.06	55	56	0.63245553	1.029563014
	0.44	1.17	54	56	0.66332496	1.081665383
	0.37	0.98	55	56	0.60827625	0.989949494
	0.38	1.01	55	56	0.6164414	1.004987562

Calculation Summary

Data Entry Area

Sample Type	26A	Pitot Tube Correction Factor	0.84	Entered By (initials)		***CJT***
Source	OVEN Outlet	Console ID	SC-M1533	Checked by (initials)		***CMT***
Condition	COND 1	DGMCF	0.972	Corrected by (initials)		***CMT***
Run	3	$\Delta H_@$	1.886		Value	Link Checked
Date	27-Mar	Nozzle Diameter (in)	0.218	% CO		
Duct Diameter (ft)	1.75	Std Temp (°F)	68	% CO_2	0.11	
Duct Depth (ft)		Bar Press ("Hg, meas)	29.8	% O_2	20.74	
Duct Width (ft)		Meter Elev (ft) (rel to Brmtr)	0	% H_2		
		Static Press ("H_2O)	2.1	% CH_4		

Times		**DGM Volumes** (as read)		**Impinger Catch (g)**			
start	10:54	start	404.500		Initial	Final	
stop	11:18	stop	418.877	1	631.5	633.4	1.9
start	11:22	start	418.877	2	760.4	760.7	0.3
stop	11:46	stop	433.270	3	602.1	602.5	0.4
start		start		4	840.8	846.4	5.6
stop		stop		5			--
start		start		6			--
stop		stop		7			--
start		start		8			--
stop		stop		9			--
start		start		10			--
stop		stop					
start		start					
stop		stop					
start		start					
stop		stop					
start		start					
stop		stop					
						Total Wt Gain	8.2
Duration	48	Total	28.770				

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	√ΔP	√ΔH
Averages	0.43	1.15	60	56.8	0.6576	1.0724

Individual	0.38	1.01	57	56	0.6164414	1.00498756
Readings	0.42	1.12	57	56	0.64807407	1.05830052
	0.44	1.17	58	56	0.66332496	1.08166538
	0.40	1.06	58	56	0.63245553	1.02956301
	0.45	1.20	58	56	0.67082039	1.09544512
	0.49	1.30	59	56	0.7	1.14017543
	0.45	1.20	62	57	0.67082039	1.09544512
	0.45	1.20	63	58	0.67082039	1.09544512
	0.44	1.17	62	57	0.66332496	1.08166538
	0.51	1.36	63	58	0.71414284	1.16619038
	0.40	1.06	64	58	0.63245553	1.02956301
	0.37	0.98	63	58	0.60827625	0.98994949

Shamrock HF Study
OVEN Inlet **COND 2**
26A
Emission Calculations

Pollutant: **Hydrogen Fluoride**

Run	Date	Time	Total HF Catch (mg)	Sample Volume (dscf)	HF Concentration (g/dscf)	Flow Rate (dscfm)	HF Emissions (lb/hr)
1	3/28/2025	07:51-08:47	308	32.610	9.45E-03	2,179	2.72
2	3/28/2025	09:06-10:01	288	33.983	8.47E-03	2,288	2.57
3	3/28/2025	10:17-11:12	316	34.979	9.03E-03	2,249	2.69
AVERAGE			**304**	**33.857**	**8.98E-03**	**2,239**	**2.66**

Calculation Summary

Project Name	**Shamrock HF Study**
Project Number	**60751134**
Facility	**HENDERSON, KY**

Sample Type	26A	26A	26A	Averages
Source	OVEN Inlet	OVEN Inlet	OVEN Inlet	
Condition	COND 2	COND 2	COND 2	
Run	1	2	3	
Date	3/28/2025	3/28/2025	3/28/2025	
Time Start	7:51	9:06	10:17	
Time Stop	8:47	10:01	11:12	
Sampling Times	07:51-08:47	09:06-10:01	10:17-11:12	
Duct Diameter (ft) *(equivalent if square duct)*	1.42	1.42	1.42	
Pitot Tube Correction Factor	0.84	0.84	0.84	
Nozzle Diameter (inches)	0.314	0.314	0.314	
DGMCF (Y_d)	1.007	1.007	1.007	
Orifice Factor ("wc) ($\Delta H_{@}$)	1.765	1.765	1.765	
Console Identification	SC-M1540	SC-M1540	SC-M1540	
Standard Temperature (°F) (T_{std})	68	68	68	
Barometric Pressure Measured ("Hg)	29.63	29.62	29.63	
Stack Elevation (ft) (relative to Barometer)	0	0	0	
Barometric Pressure ("Hg) (P_{bar})	29.63	29.62	29.63	
Average Stack Temperature (°F) (T_S)	105.5	117.3	125.8	116.2
Average DGM Temp (°F) (T_m)	68.8	75.7	81.8	
Average Delta H ("wc) (ΔH_{avg})	1.83	2.04	2.20	
Condensed Water (g)	6.8	6.8	10.8	
Test Duration (minutes) (Θ)	48	48	48	
Static Pressure ("wc) (P_g)	-6.50	-6.50	-6.50	
Carbon Monoxide Content (%) (%CO)	0	0	0	
Carbon Dioxide Content (%) (%CO_2)	0.14	0.15	0.15	
Oxygen Content (%) (%O_2)	20.75	20.78	20.81	
Hydrogen Content (%) (%H_2)	0.0	0.0	0.0	
Methane Content (%) (%CH_4)	0.0	0.0	0.0	
Nitrogen Content (%) (%N_2)	79.11	79.07	79.04	
Meter Volume (dcf) (V_m)	32.598	34.409	35.800	
Average square root of ΔP ($(\sqrt{\Delta P})_{avg}$)	0.434	0.460	0.457	
Absolute Stack Pressure ("Hg) (P_S)	29.15	29.14	29.15	
Absolute Stack Temperature (°R) (T_S)	565.2	577.0	585.5	575.9
Flue Gas Moisture (%) (B_{WS})	0.97	0.93	1.44	1.11
Moisture at saturation	7.72	10.88	13.76	
Moisture used in Calculation	0.97	0.93	1.44	1.11
Gas Molecular Wt (Wet) (g/g-mole) (M_S)	28.75	28.75	28.70	
Corrected Vol of Gas Sample (dcf) ($V_{m(actual)}$)	32.826	34.650	36.051	
Volume at Meter (dscf) (V_M)	32.610	33.983	34.979	
Average Gas Velocity (ft/sec) (V_S)	25.57	27.42	27.47	26.82
Avg Flow Rate (acfh)	145,124	155,603	155,902	152,210
Avg Flow Rate (acfm)	2,419	2,593	2,598	2,537
Avg Flow Rate (scfh)	132,017	138,599	136,896	135,837
Avg Flow Rate (scfm)	2,200	2,310	2,282	2,264
Avg Flow Rate (dscfh) (Q_{sd})	130,731	137,304	134,932	134,322
Avg Flow Rate (dscfm) (Q_{sd})	2,179	2,288	2,249	2,239
Isokinetic Sampling Rate (%) (I)	91.39	90.68	94.98	

Calculation Summary

Data Entry Area

Sample Type	26A	Pitot Tube Correction Factor	0.84	Entered By (initials)		*CJT*
Source	OVEN Inlet	Console ID	SC-M1540	Checked by (initials)		*CMT*
Condition	COND 2	DGMCF	1.007	Corrected by (initials)		*CMT*
Run	1	$\Delta H_@$	1.765		Value	Link Checked
Date	28-Mar	Nozzle Diameter (in)	0.314	% CO		
Duct Diameter (ft)	1.42	Std Temp (°F)	68	% CO_2	0.14	
Duct Depth (ft)		Bar Press ("Hg, meas)	29.63	% O_2	20.75	
Duct Width (ft)		Meter Elev (ft) (rel to Brmtr)	0	% H_2		
		Static Press ("H_2O)	-6.5	% CH_4		

Times		DGM Volumes (as read)	
start	7:51	start	774.545
stop	8:15	stop	790.308
start	8:23	start	790.563
stop	8:47	stop	807.398
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
Duration	48	Total	32.598

Impinger Catch (g)	Initial	Final	
1	747.9	747.9	0
2	726.7	726.2	-0.5
3	599.1	599.7	0.6
4	839.4	846.1	6.7
5			--
6			--
7			--
8			--
9			--
10			--
		Total Wt Gain	6.8

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	√ΔP	√ΔH
Averages	0.19	1.83	106	68.8	0.4337	1.3415
Individual Readings	0.11	1.10	105	66	0.33166248	1.04880885
	0.12	1.20	107	67	0.34641016	1.09544512
	0.14	1.30	110	67	0.37416574	1.14017543
	0.24	2.30	86	67	0.48989795	1.51657509
	0.24	2.30	85	67	0.48989795	1.51657509
	0.25	2.40	106	68	0.5	1.54919334
	0.15	1.40	107	69	0.38729833	1.18321596
	0.18	1.70	108	69	0.42426407	1.30384048
	0.21	2.00	110	71	0.45825757	1.41421356
	0.27	2.60	113	70	0.51961524	1.61245155
	0.21	2.00	114	72	0.45825757	1.41421356
	0.18	1.70	115	72	0.42426407	1.30384048

Calculation Summary

Data Entry Area

Sample Type	26A	Pitot Tube Correction Factor	0.84	Entered By (initials)		***CJT***
Source	OVEN Inlet	Console ID	SC-M1540	Checked by (initials)		***CMT***
Condition	COND 2	DGMCF	1.007	Corrected by (initials)		***CMT***
Run	2	$\Delta H_@$	1.765		Value	Link Checked
Date	28-Mar	Nozzle Diameter (in)	0.314	% CO		
Duct Diameter (ft)	1.42	Std Temp (°F)	68	% CO_2	0.15	
Duct Depth (ft)		Bar Press ("Hg, meas)	29.62	% O_2	20.78	
Duct Width (ft)		Meter Elev (ft) (rel to Brmtr)	0	% H_2		
		Static Press ("H_2O)	-6.5	% CH_4		

Times	
start	9:06
stop	9:30
start	9:37
stop	10:01
start	
stop	
start	
stop	
start	
stop	
start	
stop	
start	
stop	
start	
stop	
start	
stop	
Duration	48

DGM Volumes (as read)	
start	807.587
stop	824.076
start	824.421
stop	842.341
start	
stop	
start	
stop	
start	
stop	
start	
stop	
start	
stop	
start	
stop	
start	
stop	
Total	34.409

Impinger Catch (g)

	Initial	Final	
1	721.6	721.2	-0.4
2	754.0	754.6	0.6
3	654.2	655.4	1.2
4	886.3	891.7	5.4
5			--
6			--
7			--
8			--
9			--
10			--
		Total Wt Gain	6.8

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	√ΔP	√ΔH
Averages	0.21	2.04	117	75.7	0.4602	1.4200
Individual	0.15	1.40	116	73	0.38729833	1.183215957
Readings	0.17	1.60	119	73	0.41231056	1.264911064
	0.20	1.90	119	75	0.4472136	1.378404875
	0.25	2.40	121	75	0.5	1.549193338
	0.22	2.10	123	76	0.46904158	1.449137675
	0.20	1.90	124	75	0.4472136	1.378404875
	0.15	1.40	119	76	0.38729833	1.183215957
	0.19	1.80	123	76	0.43588989	1.341640786
	0.22	2.10	125	77	0.46904158	1.449137675
	0.31	3.00	109	77	0.55677644	1.732050808
	0.26	2.50	105	77	0.50990195	1.58113883
	0.25	2.40	105	78	0.5	1.549193338

Calculation Summary

Data Entry Area

Sample Type	26A	Pitot Tube Correction Factor	0.84	Entered By (initials)	*CJT*	
Source	OVEN Inlet	Console ID	SC-M1540	Checked by (initials)	*CMT*	
Condition	COND 2	DGMCF	1.007	Corrected by (initials)	*CMT*	
Run	3	$\Delta H_@$	1.765		Value	Link Checked
Date	28-Mar	Nozzle Diameter (in)	0.314	% CO		
Duct Diameter (ft)	1.42	Std Temp (°F)	68	% CO_2	0.15	
Duct Depth (ft)		Bar Press ("Hg, meas)	29.63	% O_2	20.81	
Duct Width (ft)		Meter Elev (ft) (rel to Brmtr)	0	% H_2		
		Static Press ("H_2O)	-6.5	% CH_4		

Times		**DGM Volumes** (as read)		**Impinger Catch (g)**			
start	10:17	start	842.574		Initial	Final	
stop	10:41	stop	860.185	1	740.0	742.0	2
start	10:48	start	860.531	2	769.0	769.4	0.4
stop	11:12	stop	878.720	3	670.3	671.5	1.2
start		start		4	875.8	883.0	7.2
stop		stop		5			--
start		start		6			--
stop		stop		7			--
start		start		8			--
stop		stop		9			--
start		start		10			--
stop		stop					
start		start					
stop		stop					
start		start					
stop		stop					
start		start					
stop		stop					
						Total Wt Gain	10.8
Duration	48	Total	35.800				

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	√ΔP	√ΔH
Averages	0.21	2.20	126	81.8	0.4573	1.4806
Individual Readings	0.17	1.80	126	79	0.41231056	1.34164079
	0.21	2.20	133	80	0.45825757	1.4832397
	0.23	2.40	136	80	0.47958315	1.54919334
	0.21	2.20	116	80	0.45825757	1.4832397
	0.23	2.40	104	80	0.47958315	1.54919334
	0.21	2.20	91	81	0.45825757	1.4832397
	0.16	1.70	130	83	0.4	1.30384048
	0.19	2.00	133	83	0.43588989	1.41421356
	0.21	2.20	135	83	0.45825757	1.4832397
	0.26	2.70	135	83	0.50990195	1.64316767
	0.23	2.40	135	84	0.47958315	1.54919334
	0.21	2.20	136	86	0.45825757	1.4832397

Shamrock HF Study
OVEN Outlet **COND 2**
26A
Emission Calculations

Pollutant: **Hydrogen Fluoride**

Run	Date	Time	Total HF Catch (mg)	Sample Volume (dscf)	HF Concentration (g/dscf)	Flow Rate (dscfm)	HF Emissions (lb/hr)
1	3/28/2025	07:51-08:47	1.42	27.050	5.25E-05	4,995	0.035
2	3/28/2025	09:06-10:01	1.16	26.937	4.31E-05	4,968	0.028
3	3/28/2025	10:17-11:12	1.05	26.068	4.03E-05	4,775	0.025
AVERAGE			**1.21**	**26.685**	**4.53E-05**	**4,913**	**0.029**

Calculation Summary

Project Name	**Shamrock HF Study**
Project Number	**60751134**
Facility	**Henderson, KY**

Sample Type	26A	26A	26A	Averages
Source	OVEN Outlet	OVEN Outlet	OVEN Outlet	
Condition	COND 2	COND 2	COND 2	
Run	1	2	3	
Date	3/28/2025	3/28/2025	3/28/2025	
Time Start	7:51	9:06	10:17	
Time Stop	8:47	10:01	11:12	
Sampling Times	07:51-08:47	09:06-10:01	10:17-11:12	
Duct Diameter (ft) *(equivalent if square duct)*	1.75	1.75	1.75	
Pitot Tube Correction Factor	0.84	0.84	0.84	
Nozzle Diameter (inches)	0.218	0.218	0.218	
DGMCF (Y_d)	0.972	0.972	0.972	
Orifice Factor ("wc) ($\Delta H_@$)	1.886	1.886	1.886	
Console Identification	SC-M1533	SC-M1533	SC-M1533	
Standard Temperature (°F) (T_{std})	68	68	68	
Barometric Pressure Measured ("Hg)	29.63	29.63	29.63	
Stack Elevation (ft) (relative to Barometer)	0	0	0	
Barometric Pressure ("Hg) (P_{bar})	29.63	29.63	29.63	
Average Stack Temperature (°F) (T_S)	68.2	74.7	80.5	74.4
Average DGM Temp (°F) (T_m)	63.0	68.3	74.8	
Average Delta H ("wc) (ΔH_{avg})	1.05	1.07	1.00	
Condensed Water (g)	6.5	10.8	11.2	
Test Duration (minutes) (Θ)	48	48	48	
Static Pressure ("wc) (P_g)	1.65	1.65	1.60	
Carbon Monoxide Content (%) (%CO)	0	0	0	
Carbon Dioxide Content (%) (%CO_2)	0.13	0.15	0.14	
Oxygen Content (%) (%O_2)	20.76	20.78	20.79	
Hydrogen Content (%) (%H_2)	0.0	0.0	0.0	
Methane Content (%) (%CH_4)	0.0	0.0	0.0	
Nitrogen Content (%) (%N_2)	79.11	79.07	79.07	
Meter Volume (dcf) (V_m)	27.763	27.923	27.364	
Average square root of ΔP (($\sqrt{\Delta P})_{avg}$)	0.624	0.628	0.608	
Absolute Stack Pressure ("Hg) (P_S)	29.75	29.75	29.75	
Absolute Stack Temperature (°R) (T_S)	527.8	534.3	540.2	534.1
Flue Gas Moisture (%) (B_{WS})	1.12	1.86	1.99	1.65
Moisture at saturation	2.44	2.93	3.50	
Moisture used in Calculation	1.12	1.86	1.99	1.65
Gas Molecular Wt (Wet) (g/g-mole) (M_S)	28.73	28.65	28.64	
Corrected Vol of Gas Sample (dcf) ($V_{m(actual)}$)	26.986	27.141	26.598	
Volume at Meter (dscf) (V_M)	27.050	26.937	26.068	
Average Gas Velocity (ft/sec) (V_S)	35.21	35.72	34.76	35.23
Avg Flow Rate (acfh)	304,887	309,306	300,965	305,053
Avg Flow Rate (acfm)	5,081	5,155	5,016	5,084
Avg Flow Rate (scfh)	303,072	303,725	292,307	299,701
Avg Flow Rate (scfm)	5,051	5,062	4,872	4,995
Avg Flow Rate (dscfh) (Q_{sd})	299,677	298,089	286,502	294,756
Avg Flow Rate (dscfm) (Q_{sd})	4,995	4,968	4,775	4,913
Isokinetic Sampling Rate (%) (I)	104.70	104.82	105.54	

Calculation Summary

Data Entry Area

Sample Type	26A	Pitot Tube Correction Factor	0.84	Entered By (initials)	***CJT***
Source	OVEN Outlet	Console ID	SC-M1533	Checked by (initials)	***CMT***
Condition	COND 2	DGMCF	0.972	Corrected by (initials)	***CMT***
Run	1	$\Delta H_@$	1.886		
Date	28-Mar	Nozzle Diameter (in)	0.218		
Duct Diameter (ft)	1.75	Std Temp (°F)	68		
Duct Depth (ft)		Bar Press ("Hg, meas)	29.63		
Duct Width (ft)		Meter Elev (ft) (rel to Brmtr)	0		
		Static Press ("H_2O)	1.65		

	Value	Link Checked
% CO		
% CO_2	0.13	
% O_2	20.76	
% H_2		
% CH_4		

Times		**DGM Volumes** (as read)	
start	7:51	start	433.700
stop	8:15	stop	447.717
start	8:23	start	447.717
stop	8:47	stop	461.463
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
Duration	48	Total	27.763

Impinger Catch (g)

	Initial	Final	
1	694.4	695.8	1.4
2	694.9	694.8	-0.1
3	662.1	662.1	0
4	848.8	854.0	5.2
5			--
6			--
7			--
8			--
9			--
10			--
		Total Wt Gain	6.5

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	√ΔP	√ΔH
Averages	0.39	1.05	68	63.0	0.6239	1.0254
Individual	0.37	1.00	66	60	0.60827625	1
Readings	0.37	1.00	66	61	0.60827625	1
	0.38	1.03	67	62	0.6164414	1.01488916
	0.42	1.13	67	62	0.64807407	1.06301458
	0.44	1.19	68	62	0.66332496	1.09087121
	0.40	1.08	68	62	0.63245553	1.03923048
	0.42	1.13	69	63	0.64807407	1.06301458
	0.42	1.13	69	64	0.64807407	1.06301458
	0.41	1.11	69	64	0.64031242	1.05356538
	0.38	1.03	70	65	0.6164414	1.01488916
	0.34	0.92	70	65	0.58309519	0.9591663
	0.33	0.89	69	66	0.57445626	0.94339811

Calculation Summary

Data Entry Area

Sample Type	26A	Pitot Tube Correction Factor	0.84
Source	OVEN Outlet	Console ID	SC-M1533
Condition	COND 2	DGMCF	0.972
Run	2	$\Delta H_@$	1.886
Date	28-Mar	Nozzle Diameter (in)	0.218
Duct Diameter (ft)	1.75	Std Temp (°F)	68
Duct Depth (ft)		Bar Press ("Hg, meas)	29.63
Duct Width (ft)		Meter Elev (ft) (rel to Brmtr)	0
		Static Press ("H_2O)	1.65

Entered By (initials)	***CJT***	
Checked by (initials)	***CMT***	
Corrected by (initials)	***CMT***	
	Value	Link Checked
% CO		
% CO_2	0.15	
% O_2	20.78	
% H_2		
% CH_4		

Times		**DGM Volumes** (as read)		**Impinger Catch (g)**			
start	9:06	start	461.800		Initial	Final	
stop	9:30	stop	475.643	1	688.0	692.4	4.4
start	9:37	start	475.643	2	734.5	734.9	0.4
stop	10:01	stop	489.723	3	640.0	640.7	0.7
start		start		4	851.2	856.5	5.3
stop		stop		5			--
start		start		6			--
stop		stop		7			--
start		start		8			--
stop		stop		9			--
start		start		10			--
stop		stop					
start		start					
stop		stop					
start		start					
stop		stop					
start		start					
stop		stop					
						Total Wt Gain	10.8
Duration	48	Total	27.923				

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	√ΔP	√ΔH
Averages	0.40	1.07	75	68.3	0.6283	1.0325
Individual Readings	0.41	1.11	72	66	0.64031242	1.053565375
	0.41	1.11	73	66	0.64031242	1.053565375
	0.40	1.08	73	67	0.63245553	1.039230485
	0.44	1.19	73	68	0.66332496	1.090871211
	0.36	0.97	73	68	0.6	0.98488578
	0.32	0.86	74	68	0.56568542	0.92736185
	0.40	1.08	76	69	0.63245553	1.039230485
	0.44	1.19	77	69	0.66332496	1.090871211
	0.42	1.13	76	69	0.64807407	1.063014581
	0.45	1.22	76	69	0.67082039	1.104536102
	0.37	1.00	77	70	0.60827625	1
	0.33	0.89	76	70	0.57445626	0.943398113

Calculation Summary

Data Entry Area

Sample Type	26A	Pitot Tube Correction Factor	0.84	Entered By (initials)		***CJT***
Source	OVEN Outlet	Console ID	SC-M1533	Checked by (initials)		***CMT***
Condition	COND 2	DGMCF	0.972	Corrected by (initials)		***CMT***
Run	3	$\Delta H_@$	1.886		Value	Link Checked
Date	28-Mar	Nozzle Diameter (in)	0.218	% CO		
Duct Diameter (ft)	1.75	Std Temp (°F)	68	% CO_2	0.14	
Duct Depth (ft)		Bar Press ("Hg, meas)	29.63	% O_2	20.79	
Duct Width (ft)		Meter Elev (ft) (rel to Brmtr)	0	% H_2		
		Static Press ("H_2O)	1.6	% CH_4		

Times		**DGM Volumes** (as read)	
start	10:17	start	490.000
stop	10:41	stop	503.550
start	10:48	start	503.550
stop	11:12	stop	517.364
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
start		start	
stop		stop	
Duration	48	Total	27.364

Impinger Catch (g)

	Initial	Final	
1	631.7	637.0	5.3
2	759.3	759.7	0.4
3	603.0	603.6	0.6
4	846.4	851.3	4.9
5			--
6			--
7			--
8			--
9			--
10			--
		Total Wt Gain	11.2

	ΔP ("H_2O)	ΔH ("H_2O)	Stack Temp (°F)	DGM Temp (°F)	√ΔP	√ΔH
Averages	0.37	1.00	81	74.8	0.6078	0.9993
Individual Readings	0.37	1.00	80	72	0.60827625	1
	0.37	1.00	81	73	0.60827625	1
	0.41	1.11	79	73	0.64031242	1.05356538
	0.37	1.00	78	74	0.60827625	1
	0.34	0.92	79	74	0.58309519	0.9591663
	0.32	0.86	79	74	0.56568542	0.92736185
	0.38	1.03	81	76	0.6164414	1.01488916
	0.38	1.03	81	76	0.6164414	1.01488916
	0.42	1.13	81	76	0.64807407	1.06301458
	0.39	1.05	82	76	0.6244998	1.02469508
	0.35	0.95	82	77	0.59160798	0.97467943
	0.34	0.92	83	77	0.58309519	0.9591663

AECOM

900 Perimeter Park Drive, Suite A
Morrisville, NC 27560

Privileged and Confidential.
Attorney Work Product.
Prepared at the Direction of Counsel.

Project No: 60751134.00000
Shamrock Technologies

Hydrogen Fluoride

EPA Method 26A

Analytical Report
44015

el1

Element One, Inc.
6319-D Carolina Beach Rd., Wilmington, NC 28412
910-793-0128 FAX: 910-792-6853 e1lab@e1lab.com

The following data for Analytical Report 44015
has been reviewed for completeness, accuracy,
adherence to method protocol,
and compliance with quality assurance guidelines.

Review by:

Linda Ann

Linda Ann Webb, M.S. Analytical Chemist
November 07, 2025

Report Reviewed and Finalized By:

Ken Smith, Laboratory Director
November 07, 2025

SUMMARY OF RESULTS

Summary of Analysis

Summary of Method 26A Analysis

Element	Shamrock-Ovens-C1-STK-M26A-R1 e44015-1 Total mg	Shamrock-Ovens-C1-STK-M26A-R2 e44015-2 Total mg	Shamrock-Ovens-C1-STK-M26A-R3 e44015-3 Total mg
----------------	---------------	---------------	---------------
HF	< 0.203	< 0.192	0.228

Element	Shamrock-Ovens-C1-Inlet-M26A-R1 e44015-4 Total mg	Shamrock-Ovens-C1-Inlet-M26A-R2 e44015-5 Total mg	Shamrock-Ovens-C1-Inlet-M26A-R3 e44015-6 Total mg
----------------	---------------	---------------	---------------
HF	2.69	6.48	23.0

Element	Shamrock-Ovens-C2-STK-M26A-R1 e44015-7 Total mg	Shamrock-Ovens-C2-STK-M26A-R2 e44015-8 Total mg	Shamrock-Ovens-C2-STK-M26A-R3 e44015-9 Total mg
----------------	---------------	---------------	---------------
HF	1.42	1.16	1.05

Element	Shamrock-Ovens-C2-Inlet-M26A-R1 e44015-10 Total mg	Shamrock-Ovens-C2-Inlet-M26A-R2 e44015-11 Total mg	Shamrock-Ovens-C2-Inlet-M26A-R3 e44015-12 Total mg
----------------	---------------	---------------	---------------
HF	308	288	316

Summary of Analysis

Summary of Method 26A Analysis

Element	Reagent Blank 0.1N H_2SO_4 e44015-25 H_2SO_4 Total mg	Reagent Blank 2 0.1N H_2SO_4 e44015-26 H_2SO_4 Total mg	Reagent Blank DI Water e44015-26 DI Total mg
HF	< 0.105	< 0.105	< 0.021

ANALYTICAL NARRATIVE

Element One Analytical Narrative

Client:	AECOM	Element One #:	44015
Client ID:	60751134.00000 Shamrock Technologies	Analyst:	LAW
Method:	M26A	Dates Received:	03.31.25
Analytes:	HF	Dates Analyzed:	04.01-02.25

Summary of Analysis

The samples were prepared and analyzed according to Method 26A protocol. The samples were analyzed for fluoride on Metrohm 930/858 and 881/858 ion chromatograph systems.

Detection Limits

The Metrohm reporting limit was 0.1 µg/mL for fluoride.

Analysis QA/QC

Duplicate analyses, relative percent difference (RPD) and spike recovery data are summarized in the Quality Control section. All QA/QC data was within the criteria of the method.

Additional Comments

The reported results have not been corrected for any blank values or spike recovery values. Due to the sample matrix, it was necessary to analyze all samples at a minimum five-fold dilution to reduce interferences and to preserve the anion column. The reported results relate only to the items tested or calibrated.

This project is privileged and confidential. It is an attorney's work product and was prepared under the direction of counsel.

QUALITY CONTROL SUMMARY

Summary of Quality Control Data

Summary of Method 26A Duplicate Analysis RPD

(Method 26A QC limits: < 5% for RPD)

Element	Shamrock-Ovens-C1-STK-M26A-R1 RPD	Shamrock-Ovens-C1-STK-M26A-R2 RPD	Shamrock-Ovens-C1-STK-M26A-R3 RPD
HF	NA	NA	1.8%

Element	Shamrock-Ovens-C1-Inlet-M26A-R1 RPD	Shamrock-Ovens-C1-Inlet-M26A-R2 RPD	Shamrock-Ovens-C1-Inlet-M26A-R3 RPD
HF	1.0%	2.8%	1.2%

Element	Shamrock-Ovens-C2-STK-M26A-R1 RPD	Shamrock-Ovens-C2-STK-M26A-R2 RPD	Shamrock-Ovens-C2-STK-M26A-R3 RPD
HF	0.3%	0.5%	0.6%

Element	Shamrock-Ovens-C2-Inlet-M26A-R1 RPD	Shamrock-Ovens-C2-Inlet-M26A-R2 RPD	Shamrock-Ovens-C2-Inlet-M26A-R3 RPD
HF	0.1%	0.4%	0.6%

Element	Reagent Blank 0.1N H_2SO_4 RPD	Reagent Blank 2 0.1N H_2SO_4 RPD	Reagent Blank DI Water RPD
HF	NA	NA	NA

Summary of Quality Control Data

Summary of Method 26A Spike Recoveries

(Method 26A QC limits: 90-110% for Spike Recoveries)

Element	Shamrock-Ovens-C1-STK-M26A-R3 Recovery	Shamrock-Ovens-C1-Inlet-M26A-R3 Recovery
HF	98%	93%

Element	Shamrock-Ovens-C2-STK-M26A-R3 Recovery	Shamrock-Ovens-C2-Inlet-M26A-R3 Recovery
HF	98%	100%

Second Source Calibration Verification

*(*Laboratory QC limits: 90-110%)*

Element	DL 0.1mg/L Recovery	*QC 5.0mg/L Recovery
HF Inlets	93%	100%
HF STK	98%	98%

SAMPLE CUSTODY

Lab Tracking Number

Chain-of-Custody Record/Lab Work Request

44015

Page ___ of ___

Client	Shamrock Technologies, Henderson, KY		
Work Order Number	60751134.00000	**Phone Number**	412-841-2957
Contact Person	Charlie Thompson	**Turn Around Time**	1-week

			Analyses Requested/Other Info				
Lab ID	Field Sample ID	Sample Collection Date	Analysis				Sample Check-off
	Shamrock - Ovens - C1 - STK - 1 - M26A - H2SO4	3-27-25	M26A				✓
	Shamrock - Ovens - C1 - STK - 2 - M26A - H2SO4	3-27-25	M26A				✓
	Shamrock - Ovens - C1 - STK - 3 - M26A - H2SO4	3-27-25	M26A				✓
	Shamrock - Ovens - C1 - Inlet - 1 - M26A - H2SO4	3-27-25	M26A				✓
	Shamrock - Ovens - C1 - Inlet - 2 - M26A - H2SO4	3-27-25	M26A				✓
	Shamrock - Ovens - C1 - Inlet - 3 - M26A - H2SO4	3-27-25	M26A				✓
	Shamrock - Ovens - C2 - STK - 1 - M26A - H2SO4	3-28-25	M26A				✓
	Shamrock - Ovens - C2 - STK - 2 - M26A - H2SO4	3-28-25	M26A				✓
	Shamrock - Ovens - C2 - STK - 3 - M26A - H2SO4	3-28-25	M26A				✓
	Shamrock - Ovens - C2 - Inlet - 1 - M26A - H2SO4	3-28-25	M26A				✓
	Shamrock - Ovens - C2 - Inlet - 2 - M26A - H2SO4	3-28-25	M26A				✓
	Shamrock - Ovens - C2 - Inlet - 3 - M26A - H2SO4	3-28-25	M26A				✓

Notes: M26A - Hydrogen Fluoride by IC per Method 9057. Analyze samples in duplicate as per Method. Starting Impinger volumes; H2SO4________ml. Approximate Final pH _______

NOTE ON REPORT: Privileged and Confidential, Attorney Work Product, Prepared at the Direction of Counsel.

Relinquished By	Received By	Date	Time	Lab Use Only	
	Lisa Britton	3.31.25	1230	Shipper	Air Bill #
				Opened By	Date/Time
				Temp °C	Condition
				Custody Seals: Yes No None N/A	

Laboratory Comments: Samples received in good condition. No empty containers.

Per Charles via phone, analyze both RB's. 5 day TAT - 3.31.25
LLB

ANALYTICAL DATA

Analytical Calculations

HF -

Total HX (mg) =X Results (µg/mL)*Dilution*Beginning Volume (mL) /1000*Correction Factor

Where-

X Results= Raw sample concentration (ppm)—*HF IC Data Sheet*

$$\text{Dilution} = \frac{\text{Diluted Volume}}{\text{Aliquot}}$$—*IC Run Sheet*

Beginning Volume--*Sample Submission*

1.053= Correction factor for hydrogen fluoride

Analytical Calculations

Spike Recovery-

$$\text{Spike (\%)} = \frac{\text{(Spiked Result (µg/mL) – Sample Result (µg/mL))}}{\text{Spike Amount (µg/mL)}} \quad \text{X100}$$

Where-

Spike Result = Raw sample concentration (ppm)--*IC-Data Sheet*

Sample Result = Raw sample concentration (ppm)--*IC-Data Sheet*

Spike Amount—*IC Data Sheet*

Duplicate Analysis RPD-

$$\text{RPD (\%)} = \frac{\text{(Duplicate Result (µg/mL) - Sample Result (µg/mL))}}{\text{Average (µg/mL)}} \quad \text{X100}$$

Where-

Sample Result and Duplicate Results=Raw sample concentration (ppm)--*IC-Data Sheet*

$$\text{Average} = \frac{\text{(Duplicate + Sample Results)}}{2}$$

elementOne **AIR TESTING SAMPLE SUBMISSION FORM** **Lab ID 44015**

RUSH---5 DAY TAT
Privileged and Confidential. Attorney Work Product.
Prepared at the Direction of Counsel.

Analysis Due Date 04.03.25
QA/QC/Report Due Date 04.04.25

Client:	AECOM
Project No	60751134.00000

Date Rec	03.31.25
Time Rec	1230

Volume Marked	Volume Loss	FH pH < 2	BH pH > 8	**Ref. Method:**
Y N	Y N ?	Y N	Y N	**26 / 26A**

Sample Identification

1	Shamrock-Ovens-C1-STK-M26A-R1	7	Shamrock-Ovens-C2-STK-M26A-R1
2	Shamrock-Ovens-C1-STK-M26A-R2	8	Shamrock-Ovens-C2-STK-M26A-R2
3	Shamrock-Ovens-C1-STK-M26A-R3	9	Shamrock-Ovens-C2-STK-M26A-R3
	Shamrock-Ovens-C1-STK-M26A-R3 Spike		Shamrock-Ovens-C2-STK-M26A-R3 Spike
4	Shamrock-Ovens-C1-Inlet-M26A-R1	10	Shamrock-Ovens-C2-Inlet-M26A-R1
5	Shamrock-Ovens-C1-Inlet-M26A-R2	11	Shamrock-Ovens-C2-Inlet-M26A-R2
6	Shamrock-Ovens-C1-Inlet-M26A-R3	12	Shamrock-Ovens-C2-Inlet-M26A-R3
	Shamrock-Ovens-C1-Inlet-M26A-R3 Spike		Shamrock-Ovens-C2-Inlet-M26A-R3 Spike

Analyses Requested	Samples 1-12 HF

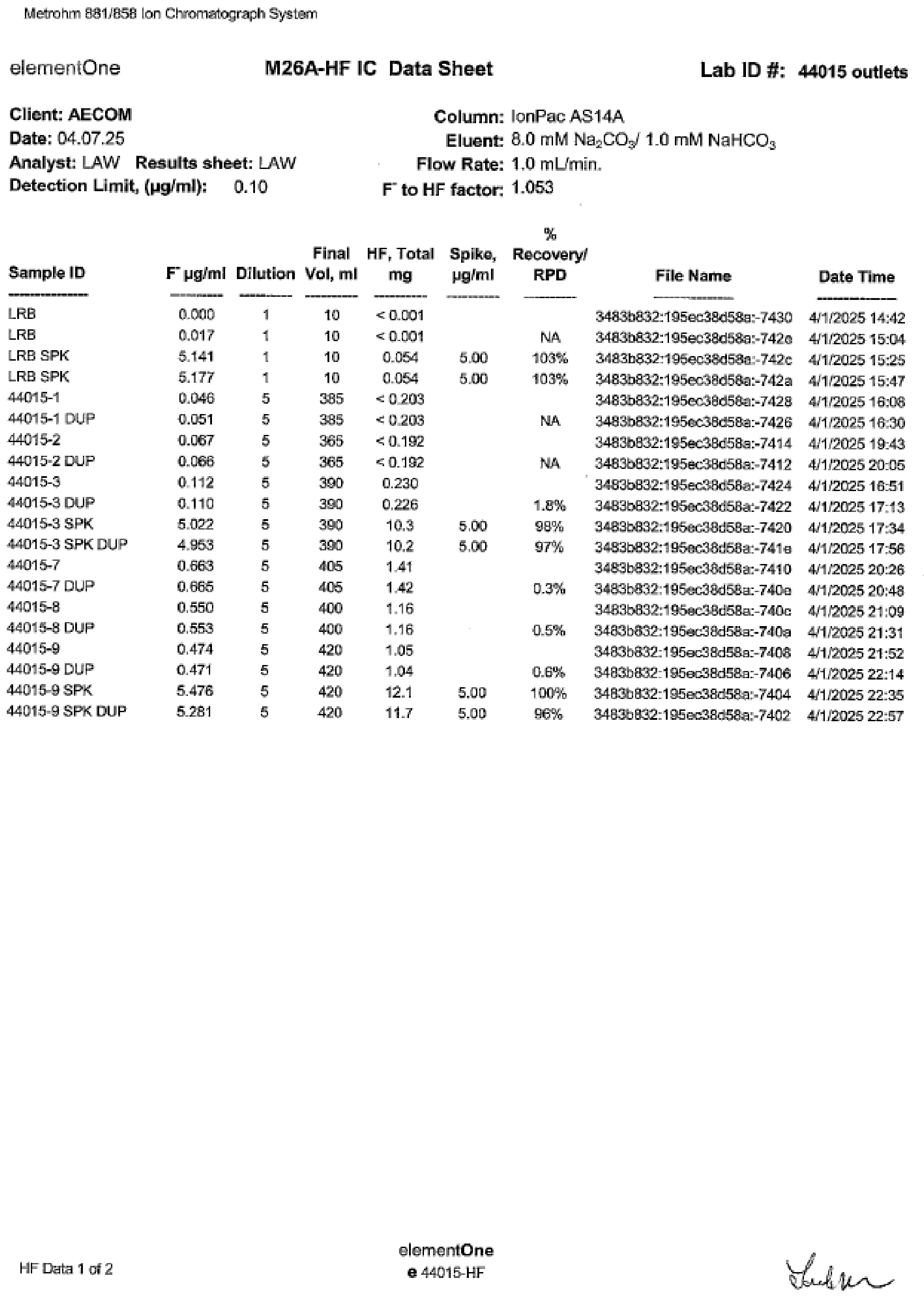
Runs/FB

	FH Impinger 1 (or Combined Imp)		FH Impinger 2		FH Impinger 3		BH Impinger 4 (or Combined Imp)		BH Impinger 5	
Lab ID	BV, ml	FV, ml	BV, ml	FV, ml	BV, ml	FV, ml	BV, ml	FV, ml	BV, ml	FV, ml
1	385									
2	365									
3.S	390									
4	375									
5	360									
6.S	410									
7	405									
8	400									
9.S	420									
10	405									
11	400									
12.S	405									

Lab Communications

SS Page 1 of 2
3/31/2025 4:49:51 PM
SS By ZZB

M26A Prep By / Date LAW 04.01.25
Labeled By / Date DB 03.31.25
ID Verification By/Date [illegible] LAW 04.01.25



Metrohm 881/858 Ion Chromatograph System

elementOne

M26A-HF IC Data Sheet

Lab ID #: **44015 outlets**

Client: AECOM
Date: 04.07.25
Analyst: LAW **Results sheet:** LAW
Detection Limit, (µg/ml): 0.10

Column: IonPac AS14A
Eluent: 8.0 mM Na_2CO_3/ 1.0 mM $NaHCO_3$
Flow Rate: 1.0 mL/min.
F^- to HF factor: 1.053

Sample ID	F^- µg/ml	Dilution	Final Vol, ml	HF, Total mg	Spike, µg/ml	% Recovery/ RPD	File Name	Date Time
LRB	0.000	1	10	< 0.001			3483b832:195ec38d58a:-7430	4/1/2025 14:42
LRB	0.017	1	10	< 0.001		NA	3483b832:195ec38d58a:-742e	4/1/2025 15:04
LRB SPK	5.141	1	10	0.054	5.00	103%	3483b832:195ec38d58a:-742c	4/1/2025 15:25
LRB SPK	5.177	1	10	0.054	5.00	103%	3483b832:195ec38d58a:-742a	4/1/2025 15:47
44015-1	0.046	5	385	< 0.203			3483b832:195ec38d58a:-7428	4/1/2025 16:08
44015-1 DUP	0.051	5	385	< 0.203		NA	3483b832:195ec38d58a:-7426	4/1/2025 16:30
44015-2	0.067	5	365	< 0.192			3483b832:195ec38d58a:-7414	4/1/2025 19:43
44015-2 DUP	0.066	5	365	< 0.192		NA	3483b832:195ec38d58a:-7412	4/1/2025 20:05
44015-3	0.112	5	390	0.230			3483b832:195ec38d58a:-7424	4/1/2025 16:51
44015-3 DUP	0.110	5	390	0.226		1.8%	3483b832:195ec38d58a:-7422	4/1/2025 17:13
44015-3 SPK	5.022	5	390	10.3	5.00	98%	3483b832:195ec38d58a:-7420	4/1/2025 17:34
44015-3 SPK DUP	4.953	5	390	10.2	5.00	97%	3483b832:195ec38d58a:-741e	4/1/2025 17:56
44015-7	0.663	5	405	1.41			3483b832:195ec38d58a:-7410	4/1/2025 20:26
44015-7 DUP	0.665	5	405	1.42		0.3%	3483b832:195ec38d58a:-740e	4/1/2025 20:48
44015-8	0.550	5	400	1.16			3483b832:195ec38d58a:-740c	4/1/2025 21:09
44015-8 DUP	0.553	5	400	1.16		0.5%	3483b832:195ec38d58a:-740a	4/1/2025 21:31
44015-9	0.474	5	420	1.05			3483b832:195ec38d58a:-7408	4/1/2025 21:52
44015-9 DUP	0.471	5	420	1.04		0.6%	3483b832:195ec38d58a:-7406	4/1/2025 22:14
44015-9 SPK	5.476	5	420	12.1	5.00	100%	3483b832:195ec38d58a:-7404	4/1/2025 22:35
44015-9 SPK DUP	5.281	5	420	11.7	5.00	96%	3483b832:195ec38d58a:-7402	4/1/2025 22:57

HF Data 1 of 2

elementOne
e 44015-HF

Metrohm 881/858 Ion Chromatograph System

elementOne

M26A-HF IC Data Sheet

Lab ID #: 44015 outlets

Client: AECOM
Date: 04.07.25
Analyst: LAW **Results sheet:** LAW
Detection Limit, (µg/ml): 0.10

Column: IonPac AS14A
Eluent: 8.0 mM Na_2CO_3/ 1.0 mM $NaHCO_3$
Flow Rate: 1.0 mL/min.
F^- to HF factor: 1.053

Standards	F^- µg/ml	Dilution	QC, µg/ml	% Relative Error	% Recovery	File Name	Date Time
0	0.000					3483b832:195ec38d58a:-6f3b	4/1/2025 10:24
0.1	0.103			3.0%	103%	3483b832:195ec38d58a:-6f39	4/1/2025 10:46
1	0.959			-4.1%	96%	3483b832:195ec38d58a:-6f37	4/1/2025 11:07
3	2.964			-1.2%	99%	3483b832:195ec38d58a:-6f35	4/1/2025 11:29
5	5.118			2.4%	102%	3483b832:195ec38d58a:-6f33	4/1/2025 11:50
10	9.956			-0.4%	100%	3483b832:195ec38d58a:-6f31	4/1/2025 12:12
0.1	0.095			-5.0%	95%	3483b832:195ec38d58a:-6f27	4/2/2025 9:42
1	0.923			-7.7%	92%	3483b832:195ec38d58a:-6f25	4/2/2025 10:03
3	3.081			2.7%	103%	3483b832:195ec38d58a:-6f23	4/2/2025 10:25
5	5.171			3.4%	103%	3483b832:195ec38d58a:-6f21	4/2/2025 10:46
10	9.944			-0.6%	99%	3483b832:195ec38d58a:-6f1f	4/2/2025 11:06
Correlation-	0.999847						
QC	4.886		5.00		98%	3483b832:195ec38d58a:-743c	4/1/2025 12:33
QC	5.057		5.00		101%	3483b832:195ec38d58a:-743a	4/1/2025 12:55
QC	4.966		5.00		99%	3483b832:195ec38d58a:-741c	4/1/2025 18:17
QC	4.931		5.00		99%	3483b832:195ec38d58a:-741a	4/1/2025 18:39
QC	4.986		5.00		100%	3483b832:195ec38d58a:-7400	4/1/2025 23:18
QC	5.001		5.00		100%	3483b832:195ec38d58a:-73fe	4/1/2025 23:40
QC	5.153		5.00		103%	3483b832:195ec38d58a:-73e4	4/2/2025 4:19
QC	5.143		5.00		103%	3483b832:195ec38d58a:-73e2	4/2/2025 4:41
QC	5.148		5.00		103%	3483b832:195ec38d58a:-6f2d	4/2/2025 8:37
QC	5.187		5.00		104%	3483b832:195ec38d58a:-6f1d	4/2/2025 11:29
DL	0.098		0.10		98%	3483b832:195ec38d58a:-7434	4/1/2025 13:59
DL	0.104		0.10		104%	3483b832:195ec38d58a:-7432	4/1/2025 14:21
DL	0.090		0.10		90%	3483b832:195ec38d58a:-6f2b	4/2/2025 8:59
DL	0.100		0.10		100%	3483b832:195ec38d58a:-6f1b	4/2/2025 11:51
41959-6 QC	6.500	10	67.8		101%	3483b832:195ec38d58a:-73d0	4/2/2025 7:54
41959-6 QC DUP	6.432	10	67.8		100%	3483b832:195ec38d58a:-6f2f	4/2/2025 8:16
BLK	0.000					3483b832:195ec38d58a:-7438	4/1/2025 13:16
BLK	0.000					3483b832:195ec38d58a:-7436	4/1/2025 13:38
BLK	0.000					3483b832:195ec38d58a:-7418	4/1/2025 19:00
BLK	0.000					3483b832:195ec38d58a:-7416	4/1/2025 19:22
BLK	0.000					3483b832:195ec38d58a:-73fc	4/2/2025 0:01
BLK	0.000					3483b832:195ec38d58a:-73fa	4/2/2025 0:23
BLK	0.000					3483b832:195ec38d58a:-73e0	4/2/2025 5:02
BLK	0.000					3483b832:195ec38d58a:-73de	4/2/2025 5:24
BLK	-0.001					3483b832:195ec38d58a:-6f29	4/2/2025 9:20
BLK	0.000					3483b832:195ec38d58a:-6f19	4/2/2025 12:12

elementOne

IC Sample Sheet/Digestion Worksheet

Lab ID #: 44015

Date: 04.01.25
Analyst: OAW
Batch name: 040125-44015

Column: Shodex SI-90 4E
Conc. Eluent: 1.8 mM Na_2CO_3/ 1.7mM $NaHCO_3$
10mL ~~Conc. Eluent~~ Diluted to FV=1L with filtered UPDI
Regenerant: 100 mM H_3PO_4/ 500mM H_2SO_4
Flow Rate: 1.0 mL/min.

Instrument: 881 1858
Lot# IC12-93-2
Lot # IC12-129-1
Method: 300/26A

AS LOC.	Sample ID	Client	Analyte	Results (ug/mL)	Results (ug/mL)	Dilution	Wt (g) / FV (mL)
1	0.0			CC	MANF	R	
2	0.1		F	BBCJ05494	Sigma Aldrich	.99847	
3	1.0						
4	3.0						
5	5.0						
6	10.0						
7	CC						
8	CC						
9	Blk						
10	Blk						
11	DL						
12	DL						
13	LRB						
14	LRB						
15	LRB+						
16	LRB+						
17	44015-1	AECOM	HF		—	5X	
18	-1D	↓	↓		—	↓	
19	-3				0.112		
20	-3D				0.116		
21	-3+			5.022	~~4.958~~		rw 0402
22	-3+D			4.953	4.966		
23	CC						
24	CC						
25	Blk						

Manual integrations noted by M
Curve IC Lot # IC12-131-1 Comments: pg 1 of 3
Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #'s: **IC ME Solution** 2402512-250HPS **IC NO2 Solution** 2403050-250 HPS
QC: Spike 50 uL from 1000 ug/mL F, Cl, Br, and SO_4 Std. to 10mL sample; lot #'s listied above.
QC: Spike 20 uL from 1000 ug/mL NO_2, NO_3, and PO_4 Std. to 10mL sample; lot #'s listed above.
Submitted for QC- Date: 040325 Time: 11:53 By: ___ QC Review- Date: ___ Time: ___ By: ___

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IC Sample Sheet/Digestion Worksheet

Lab ID #: 44015

Date: 04.01.25
Analyst: LMW
Batch name: 040125-44015

Column: Shodex SI-90 4E
Conc. Eluent: 1.8 mM Na_2CO_3/ 1.7mM $NaHCO_3$
10mL ~~Conc. Eluent~~ Diluted to FV=1L with filtered UPDI
Regenerant: [✓ 100 mM H_3PO_4]/ 500mM H_2SO_4
Flow Rate: 1.0 mL/min.

Instrument: 881/858
Lot# IC12-93-2
Lot # IC12-129-1
Method: 300/26A

AS LOC.	Sample ID	Client	Analyte	Results (ug/mL)	Results (ug/mL)	Dilution	Wt (g) / FV (mL)
26	Blk						
27	44015-2	AEcom	HF		—	5X	
28	-2D	↓	↓		→	↓	
29	-7				0.665	5X	
30	-7D				0.663	↓	
31	-8				0.550		
32	-8D				0.553		
33	-9				0.474		
34	-9D				0.427		
35	-9+				5.476		
36	-9+D	↓	↓		5.281	↓	
37	CC						
38	CC						
39	Blk						
40	Blk						
41	44015-13	AEcom	HF		1.837	5X	
42	-13D				1.809	↓	
43	-14	↓	↓		2.098		
44	-14D				2.083		
45	-15				0.164		
46	-15D				0.164		
47	-15+		10ppmspk		9.853		
48	-15+D		✓		9.892	✓	
49	-19				3.106	5X	
50	-19D	↓	↓		3.165	↓	

Manual integrations noted by M

Curve IC Lot #________ Comments: pg 2 of 3

Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #'s: **IC ME Solution** ________ **IC NO2 Solution** ________

QC: Spike 50 uL from 1000 ug/mL F, Cl, Br, and SO_4 Std. to 10mL sample; lot #'s listied above.

QC: Spike 20 uL from 1000 ug/mL NO_2, NO_3, and PO_4 Std. to 10mL sample; lot #'s listed above.

Submitted for QC- Date:______ Time:______ By:______ QC Review- Date:______ Time:______ By:______

elementOne

IC Sample Sheet/Digestion Worksheet

Lab ID #: 44015

Date: 04.01.25
Analyst: LMO
Batch name: 040125-44015

Column: Shodex SI-90 4E
Conc. Eluent: 1.8 mM Na_2CO_3/ 1.7mM $NaHCO_3$
10mL ~~Conc. Eluent~~ Diluted to FV=1L with filtered UPDI
Regenerant: 100 mM ~~H_3PO_4~~/ 500mM H_2SO_4
Flow Rate: 1.0 mL/min.

Instrument: 8811858
Lot# IC12-93-2
Lot # IC12-129-1
Method: 300/26A

AS LOC.	Sample ID	Client	Analyte	Results (ug/mL)	Results (ug/mL)	Dilution	Wt (g) / FV (mL)
51	GC						
52	GC						
53	Blk						
54	Blk						
55	44015-20				6.504	5X	
56	-20D				6.395	↓	
57	-21				7.355		
58	-21D				7.420		
59	-21+				11.976		
60	-21+D				12.260		
61	GC						
62	DL						
63	Blk						
64	0.1						
65	1.0						
66	3.0						
67	5.0						
68	10.0						
69	GC						
70	DL						
71	Blk						
72	41959-6GC		HF		6.500	10X	TV=678
73	-6GC		↓		6432	↓	
74							
75							

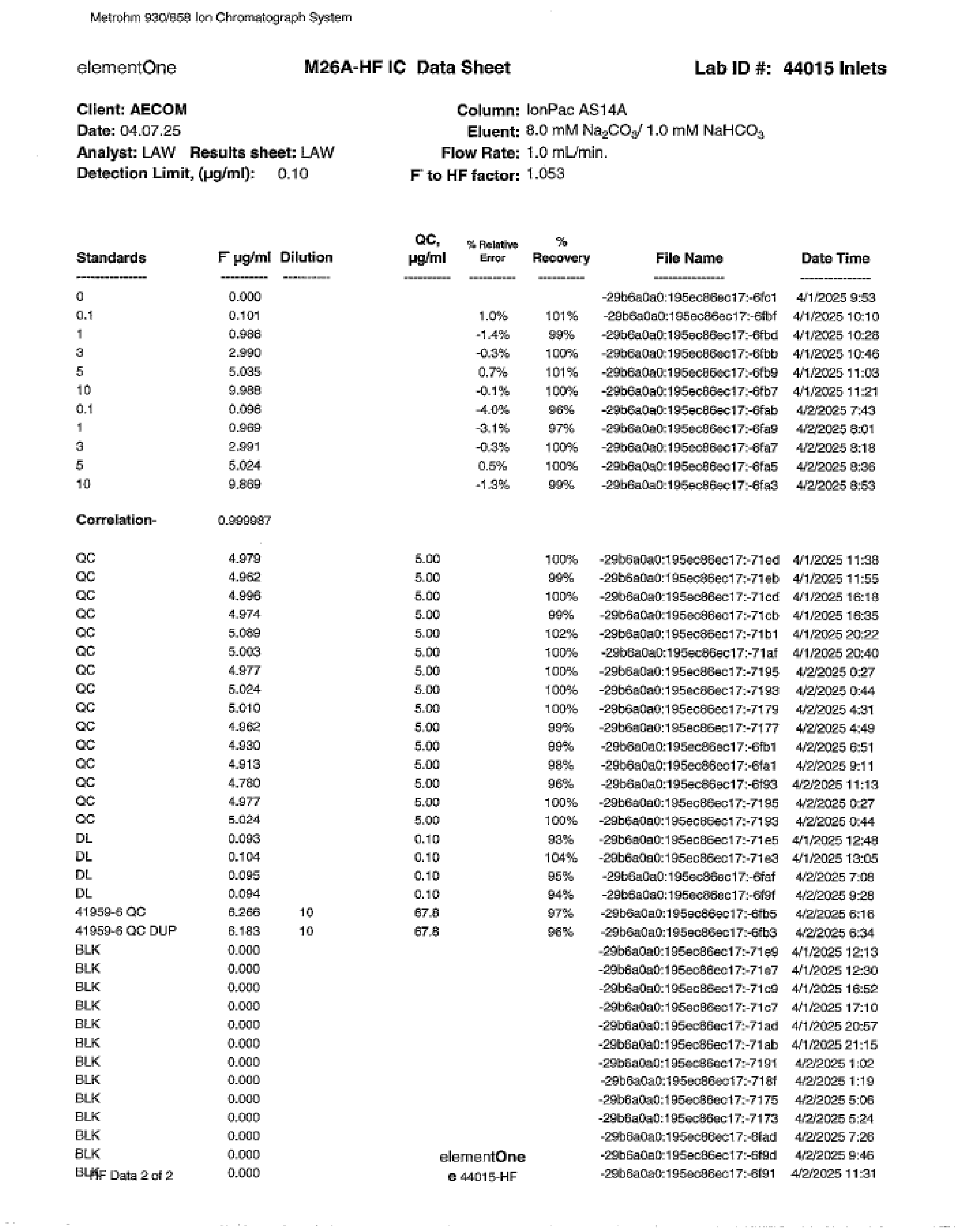
Manual integrations noted by M
Curve IC Lot #__________ Comments: pg 3 of 3
Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #'s: **IC ME Solution** __________ **IC NO2 Solution** __________
QC: Spike 50 uL from 1000 ug/mL F, Cl, Br, and SO_4 Std. to 10mL sample; lot #'s listied above.
QC: Spike 20 uL from 1000 ug/mL NO_2, NO_3, and PO_4 Std. to 10mL sample; lot #'s listed above.
Submitted for QC- Date:______ Time:______ By:______ QC Review- Date:______ Time:______ By:______

elementOne **M26A-HF IC Data Sheet** **Lab ID #: 44015 Inlets**

Client: AECOM
Date: 04.07.25
Analyst: LAW **Results sheet:** LAW
Detection Limit, (µg/ml): 0.10

Column: IonPac AS14A
Eluent: 8.0 mM Na_2CO_3/ 1.0 mM $NaHCO_3$
Flow Rate: 1.0 mL/min.
F^- to HF factor: 1.053

Sample ID	F^- µg/ml	Dilution	Final Vol, ml	HF, Total mg	Spike, µg/ml	% Recovery/ RPD	File Name	Date Time
LRB	0.000	1	10	< 0.001			-29b6a0a0:195ec86ec17:-71e1	4/1/2025 13:23
LRB	0.000	1	10	< 0.001		NA	-29b6a0a0:195ec86ec17:-71df	4/1/2025 13:40
LRB SPK	5.164	1	10	0.054	5.00	103%	-29b6a0a0:195ec86ec17:-71dd	4/1/2025 13:58
LRB SPK	5.122	1	10	0.054	5.00	102%	-29b6a0a0:195ec86ec17:-71db	4/1/2025 14:15
44015-4	1.353	5	375	2.67			-29b6a0a0:195ec86ec17:-71d9	4/1/2025 14:33
44015-4 DUP	1.367	5	375	2.70		1.0%	-29b6a0a0:195ec86ec17:-71d7	4/1/2025 14:50
44015-5	3.372	5	360	6.39			-29b6a0a0:195ec86ec17:-71c5	4/1/2025 17:27
44015-5 DUP	3.467	5	360	6.57		2.8%	-29b6a0a0:195ec86ec17:-71c3	4/1/2025 17:45
44015-6	5.299	10	410	22.9			-29b6a0a0:195ec86ec17:-6f9b	4/2/2025 10:03
44015-6 DUP	5.361	10	410	23.1		1.2%	-29b6a0a0:195ec86ec17:-6f99	4/2/2025 10:21
44015-6 SPK	9.931	10	410	42.9	5.00	93%	-29b6a0a0:195ec86ec17:-6f97	4/2/2025 10:38
44015-6 SPK DUP	9.976	10	410	43.1	5.00	92%	-29b6a0a0:195ec86ec17:-6f95	4/2/2025 10:56
44015-10	3.609	200	405	308			-29b6a0a0:195ec86ec17:-71c1	4/1/2025 18:02
44015-10 DUP	3.614	200	405	308		0.1%	-29b6a0a0:195ec86ec17:-71bf	4/1/2025 18:20
44015-11	3.426	200	400	289			-29b6a0a0:195ec86ec17:-71bd	4/1/2025 18:37
44015-11 DUP	3.414	200	400	287		0.4%	-29b6a0a0:195ec86ec17:-71bb	4/1/2025 18:55
44015-12	3.696	200	405	315			-29b6a0a0:195ec86ec17:-71b9	4/1/2025 19:12
44015-12 DUP	3.717	200	405	317		0.6%	-29b6a0a0:195ec86ec17:-71b7	4/1/2025 19:30
44015-12 SPK	8.683	200	405	740	5.00	100%	-29b6a0a0:195ec86ec17:-71b5	4/1/2025 19:47
44015-12 SPK DUP	8.646	200	405	737	5.00	99%	-29b6a0a0:195ec86ec17:-71b3	4/1/2025 20:05
44015-25 H2SO4	0.000	5	200	< 0.105			-29b6a0a0:195ec86ec17:-7181	4/2/2025 3:21
44015-25 H2SO4 DUP	0.000	5	200	< 0.105		NA	-29b6a0a0:195ec86ec17:-717f	4/2/2025 3:39
44015-26 H2SO4	0.000	5	200	< 0.105			-29b6a0a0:195ec86ec17:-717d	4/2/2025 3:56
44015-26 H2SO4 DUP	0.000	5	200	< 0.105		NA	-29b6a0a0:195ec86ec17:-717b	4/2/2025 4:14
44015-26 DI	0.000	1	200	< 0.021			-29b6a0a0:195ec86ec17:-7171	4/2/2025 5:41
44015-26 DI DUP	0.000	1	200	< 0.021		NA	-29b6a0a0:195ec86ec17:-716f	4/2/2025 5:59



Metrohm 930/858 Ion Chromatograph System

elementOne **M26A-HF IC Data Sheet** **Lab ID #: 44015 Inlets**

Client: AECOM
Date: 04.07.25
Analyst: LAW **Results sheet:** LAW
Detection Limit, (μg/ml): 0.10

Column: IonPac AS14A
Eluent: 8.0 mM Na_2CO_3/ 1.0 mM $NaHCO_3$
Flow Rate: 1.0 mL/min.
F^- to HF factor: 1.053

Standards	**F^- μg/ml**	**Dilution**	**QC, μg/ml**	**% Relative Error**	**% Recovery**	**File Name**	**Date Time**
0	0.000					-29b6a0a0:195ec86ec17:-6fc1	4/1/2025 9:53
0.1	0.101			1.0%	101%	-29b6a0a0:195ec86ec17:-6fbf	4/1/2025 10:10
1	0.986			-1.4%	99%	-29b6a0a0:195ec86ec17:-6fbd	4/1/2025 10:28
3	2.990			-0.3%	100%	-29b6a0a0:195ec86ec17:-6fbb	4/1/2025 10:46
5	5.035			0.7%	101%	-29b6a0a0:195ec86ec17:-6fb9	4/1/2025 11:03
10	9.988			-0.1%	100%	-29b6a0a0:195ec86ec17:-6fb7	4/1/2025 11:21
0.1	0.096			-4.0%	96%	-29b6a0a0:195ec86ec17:-6fab	4/2/2025 7:43
1	0.969			-3.1%	97%	-29b6a0a0:195ec86ec17:-6fa9	4/2/2025 8:01
3	2.991			-0.3%	100%	-29b6a0a0:195ec86ec17:-6fa7	4/2/2025 8:18
5	5.024			0.5%	100%	-29b6a0s0:195ec86ec17:-6fa5	4/2/2025 8:36
10	9.869			-1.3%	99%	-29b6a0a0:195ec86ec17:-6fa3	4/2/2025 8:53
Correlation-	0.999987						
QC	4.979		5.00		100%	-29b6a0a0:195ec86ec17:-71ed	4/1/2025 11:38
QC	4.962		5.00		99%	-29b6a0a0:195ec86ec17:-71eb	4/1/2025 11:55
QC	4.996		5.00		100%	-29b6a0a0:195ec86ec17:-71cd	4/1/2025 16:18
QC	4.974		5.00		99%	-29b6a0a0:195ec86ec17:-71cb	4/1/2025 16:35
QC	5.069		5.00		102%	-29b6a0a0:195ec86ec17:-71b1	4/1/2025 20:22
QC	5.003		5.00		100%	-29b6a0a0:195ec86ec17:-71af	4/1/2025 20:40
QC	4.977		5.00		100%	-29b6a0a0:195ec86ec17:-7195	4/2/2025 0:27
QC	5.024		5.00		100%	-29b6a0a0:195ec86ec17:-7193	4/2/2025 0:44
QC	5.010		5.00		100%	-29b6a0a0:195ec86ec17:-7179	4/2/2025 4:31
QC	4.962		5.00		99%	-29b6a0a0:195ec86ec17:-7177	4/2/2025 4:49
QC	4.930		5.00		99%	-29b6a0a0:195ec86ec17:-6fb1	4/2/2025 6:51
QC	4.913		5.00		98%	-29b6a0a0:195ec86ec17:-6fa1	4/2/2025 9:11
QC	4.780		5.00		96%	-29b6a0a0:195ec86ec17:-6f93	4/2/2025 11:13
QC	4.977		5.00		100%	-29b6a0a0:195ec86ec17:-7195	4/2/2025 0:27
QC	5.024		5.00		100%	-29b6a0a0:195ec86ec17:-7193	4/2/2025 0:44
DL	0.093		0.10		93%	-29b6a0a0:195ec86ec17:-71e5	4/1/2025 12:48
DL	0.104		0.10		104%	-29b6a0a0:195ec86ec17:-71e3	4/1/2025 13:05
DL	0.095		0.10		95%	-29b6a0a0:195ec86ec17:-6faf	4/2/2025 7:08
DL	0.094		0.10		94%	-29b6a0a0:195ec86ec17:-6f9f	4/2/2025 9:28
41959-6 QC	6.266	10	67.8		97%	-29b6a0a0:195ec86ec17:-6fb5	4/2/2025 6:16
41959-6 QC DUP	6.183	10	67.8		96%	-29b6a0a0:195ec86ec17:-6fb3	4/2/2025 6:34
BLK	0.000					-29b6a0a0:195ec86ec17:-71e9	4/1/2025 12:13
BLK	0.000					-29b6a0a0:195ec86ec17:-71e7	4/1/2025 12:30
BLK	0.000					-29b6a0a0:195ec86ec17:-71c9	4/1/2025 16:52
BLK	0.000					-29b6a0a0:195ec86ec17:-71c7	4/1/2025 17:10
BLK	0.000					-29b6a0a0:195ec86ec17:-71ad	4/1/2025 20:57
BLK	0.000					-29b6a0a0:195ec86ec17:-71ab	4/1/2025 21:15
BLK	0.000					-29b6a0a0:195ec86ec17:-7191	4/2/2025 1:02
BLK	0.000					-29b6a0a0:195ec86ec17:-718f	4/2/2025 1:19
BLK	0.000					-29b6a0a0:195ec86ec17:-7175	4/2/2025 5:06
BLK	0.000					-29b6a0a0:195ec86ec17:-7173	4/2/2025 5:24
BLK	0.000					-29b6a0a0:195ec86ec17:-6fad	4/2/2025 7:26
BLK	0.000					-29b6a0a0:195ec86ec17:-6f9d	4/2/2025 9:46
BLK	0.000					-29b6a0a0:195ec86ec17:-6f91	4/2/2025 11:31

HF Data 2 of 2

elementOne
e 44015-HF

elementOne

IC Sample Sheet/Digestion Worksheet

inlets

Lab ID #: 44015

Date: 04-01-25
Analyst: LW
Batch name: 040125-44015

Column: IonPac AS14A
Conc. Eluent: 8.0 mM Na_2CO_3/ 1.0mM $NaHCO_3$
10mL Conc. Eluent Diluted to ~~FV=1L~~ with filtered UPDI
Regenerent: 100 mM H_3PO_4/500 mM H_2SO_4
Flow Rate: 1.0 mL/min.

Instrument: 930/858
Lot# IC12-74-4
Lot # IC12-110-3
Method: 300/26A

AS LOC.	Sample ID	Client	Analyte	Results (ug/mL)	Results (ug/mL)	Dilution	Wt (g) / FV (mL)
1	0.0			QC	MANF	R2	
2	01		F-	BBCJ0574	Sigma Aldrich	.999982	
3	1.0						
4	3.0						
5	5.0						
6	10.0						
7	QC						
8	QC						
9	Blk						
10	Blk						
11	DL						
12	DL						
13	LRB						
14	LRB						
15	LRB+						
16	LRB+						
17	44015-4	AECOM	HF		1.353	5X	
18	-4D	↓	↓		1.367	↓	
19	-6			own curve	10.938		
20	-6D				11.273		
21	-6+				15.798		
22	-6+D				15.765		
23	QC						
24	QC						
25	Blk						

Manual integrations noted by M
Curve IC Lot # IC12-130-4 Comments: pg 1 of 4
Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #'s: **IC ME Solution** 2407543-2301#5 **IC NO2 Solution** 2403050-2301#3
QC: Spike 50 uL from 1000 ug/mL F, Cl, Br, and SO_4 Std. to 10mL sample; lot #'s listied above.
QC: Spike 20 uL from 1000 ug/mL NO_2, NO_3, and PO_4 Std. to 10mL sample; lot #'s listed above.
Submitted for QC- Date: 04.02.25 Time: 12:21 By: LW QC Review- Date: Time: By:

INLETS

elementOne **IC Sample Sheet/Digestion Worksheet** **Lab ID #:** 44015

Date: 04.01.25
Analyst: LW
Batch name: 040125-44015

Column: IonPac AS14A
Conc. Eluent: 8.0 mM Na_2CO_3/ 1.0mM $NaHCO_3$
10mL Conc. Eluent Diluted to FV=1L with filtered UPDI
Regenerent: 100 mM H_3PO_4 /500 mM H_2SO_4
Flow Rate: 1.0 mL/min.

Instrument: 980858
Lot# IC12-744
Lot # IC12-110-3
Method: 300/26A

AS LOC.	Sample ID	Client	Analyte	Results (ug/mL)	Results (ug/mL)	Dilution	Wt (g) / FV (mL)
26	Blk						
27	44015-5	AECOM	HF		3.372	5X	
28	-5D	↓	↓		3.467	↓	
29	-10	↓	↓		3.609	200X	
30	-10D	↓	↓		3.614	↓	
31	-11	↓	↓		3.426	↓	
32	-11D	↓	↓		3.414	↓	
33	-12	↓	↓		3.696	↓	
34	-12D	↓	↓		3.717	↓	
35	-12+	↓	↓		8.683	↓	
36	-12+D	↓	↓		8.646	↓	
37	QC						
38	QC						
39	Blk						
40	Blk						
41	44015-16	AECOM	HF		2.465	100X	
42	-16D	↓	↓		2.446	↓	
43	-17	↓	↓		2.047	↓	
44	-17D	↓	↓		2.046	↓	
45	-18	↓	↓		0.193	↓	
46	-18D	↓	↓		0.194	↓	
47	-18+	↓	↓ 10ppm		10.200	↓	
48	-18+D	↓	↓ spk		10.363	↓	
49	-22	↓	↓		4.132	20X	
50	-22 D	↓	↓		4.104	↓	

Manual integrations noted by M
Curve IC Lot #__________ Comments: pg 2 of 4
Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #'s: **IC ME Solution** __________ **IC NO2 Solution** __________
QC: Spike 50 uL from 1000 ug/mL F, Cl, Br, and SO_4 Std. to 10mL sample; lot #'s listied above.
QC: Spike 20 uL from 1000 ug/mL NO_2, NO_3, and PO_4 Std. to 10mL sample; lot #'s listed above.
Submitted for QC- Date:______ Time:______ By:______ QC Review- Date:______ Time:______ By:______

INLETS

elementOne

IC Sample Sheet/Digestion Worksheet

Lab ID #: 44015

Date: 04.01.25
Analyst: LAW
Batch name: 040125-44015

Column: IonPac AS14A
Conc. Eluent: 8.0 mM Na_2CO_3/ 1.0mM $NaHCO_3$
10mL Conc. Eluent Diluted to FV=1L with filtered UPDI
Regenerent: 100 mM H_3PO_4 /500 mM H_2SO_4
Flow Rate: 1.0 mL/min.

Instrument: 9301858
Lot# 1C12-74-4
Lot # 1C12-110-3
Method: 300/26A

AS LOC.	Sample ID	Client	Analyte	Results (ug/mL)	Results (ug/mL)	Dilution	Wt (g) / FV (mL)
51	CC						
52	CC						
53	Blk						
54	BlK						
55	44015-23	AECOM	HF		5.750	20X	
56	-23D	↓			5.790	↓	
57	-24	↓	↓		6.268	↓	
58	-24D	↓	↓		6.208	↓	
59	-24+	↓	↓		11.253	↓	
60	-24+D	↓	↓		11.093	↓	
61	-25 H_2SO_4	↓	↓		—	5X	
62	-25 H_2SO_4D	↓	↓		—	↓	
63	-26 H_2SO_4	↓	↓		—	↓	
64	-26 H_2SO_4D	↓	↓		—	↓	
65	CC						
66	CC						
67	Blk						
68	BlK						
69	44015-26DI	AECOM	HF		—	1X	
70	-26DID	↓	↓		—	↓	
71	41959-6 -CC		HF		6.266	10X	TV=67.8
72	-6 -CC		↓		6.183	↓	
73	CC						
74	BL						
75	BK						

Manual integrations noted by M
Curve IC Lot #__________ Comments: pg 3 of 4
Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #'s: **IC ME Solution** ________ **IC NO2 Solution** ________
QC: Spike 50 uL from 1000 ug/mL F, Cl, Br, and SO_4 Std. to 10mL sample; lot #'s listied above.
QC: Spike 20 uL from 1000 ug/mL NO_2, NO_3, and PO_4 Std. to 10mL sample; lot #'s listed above.
Submitted for QC- Date:______ Time:______ By:______ QC Review Date:______ Time:______ By:______

INLETS

elementOne **IC Sample Sheet/Digestion Worksheet** **Lab ID #:** 44015

Date: 04.01.25
Analyst: Lw
Batch name: 040125-44015

Column: IonPac AS14A
Conc. Eluent: 8.0 mM Na_2CO_3/ 1.0mM $NaHCO_3$
10mL Conc. Eluent Diluted to FV=1L with filtered UPDI
Regenerent: 100 mM H_3PO_4 /500 mM H_2SO_4
Flow Rate: 1.0 mL/min.

Instrument: 9301858
Lot# IC12-744
Lot # 102410-3
Method: 300/26A

AS LOC.	Sample ID	Client	Analyte	Results (ug/mL)	Results (ug/mL)	Dilution	Wt (g) / FV (mL)
76	0.1						
77	1.0						
78	3.0						
79	5.0						
80	10.0						
81	QC						
82	DL						
83	Blk						
84	44015-6	AECOM	HF		5.299	10X	
85	-6D	↓	↓		5.361	↓	
86	-6+				9.931		
87	-6+D				9.975		
88	CC						
89	Blk						

Manual integrations noted by M
Curve IC Lot #________ Comments: pg 4 of 4
Spike 50 uL from 1000 ug/mL Std. to 10mL sample Lot #'s: **IC ME Solution** ________ **IC NO2 Solution** ________
QC: Spike 50 uL from 1000 ug/mL F, Cl, Br, and SO_4 Std. to 10mL sample; lot #'s listed above.
QC: Spike 20 uL from 1000 ug/mL NO_2, NO_3, and PO_4 Std. to 10mL sample; lot #'s listed above.
Submitted for QC- Date:____ Time:____ By:____ QC Review- Date:____ Time:____ By:____

Attachment B

Raw Field Data

Sample Type	26A	Date	03/27/2025		Barometer ID	NWS	Page 1 of 1
Project Name	Shamrock HF Eng.	Cond: 1	Run: 1		Bar. Press. ("Hg)	29.78	**Train Leak Rate** (cfm @ "Hg)
Project Number	00751154	Console ID	SC-M1540		Stat. Press. ("H_2O)	-6.5	Initial 0.000 @ 15"
Facility	Shamrock KY	DGMCF	1.007		Probe ID	IP-M0405	Final 0.000 @ 8"
Source	Oven-Inlet	ΔH@ 1.765	K_f 10.4		PTCF	0.84	**Pitot Tube Leak Check** ("H_2O@"H_2O)
Operator	JY				Meter Elevation (ft) (relative to Barometer)	0	Initial (-) 0.0 @ 5.6
Duct Dimension(s)	17"	Nozzle Dia (in)	0.314				Initial (+) 0.0 @ 4.8
Nozzle Calibration	0.314	0.314	0.314	Caliper Used	ID		Final (-) 0.0 @ 6.0
					Calibration Exp Date		Final (+) 0.0 @ 5.5

Post-Test Stack TC Check	Reference Thermometer ID	Ref Thermometer Exp Date	Thermometer and TC agree within 2°F Y / N	Post-Test: Are Pitots Damaged? Y [✓ N]

Point	Clock Time	Elapsed Time (optional)	DGM Reading (ft³)	ΔP ("H_2O)	ΔH ("H_2O)	Temperature (°F) Stack	Probe (248-273)	Filter (248-273)	Imp Exit (<68)	DGM Outlet	Vacuum ("Hg)
A-1	8:35	0	663.295	0.08	0.83	77	261	261	47	54	1.5
2	8:39	4	665.31	0.13	1.4	79	261	259	46	53	2
3	8:43	8	667.73	0.15	1.6	81	262	259	44	53	2.5
4	8:47	12	670.31	0.15	1.6	84	259	262	47	54	2.5
5	8:51	16	672.89	0.26	2.7	81	262	260	47	54	5
6	8:55	20	676.18	0.20	2.1	83	263	260	49	55	4
port change	8:59		679.186								
B-1	9:04	24	679.186	0.12	1.2	84	265	266	47	56	2
2	9:08	28	681.50	0.14	1.5	90	259	262	49	57	2.5
3	9:12	32	684.02	0.15	1.6	89	262	259	50	57	2.5
4	9:16	36	686.64	0.20	2.1	66	261	259	50	57	4
5	9:20	40	689.63	0.20	2.1	65	263	262	51	57	4
6	9:24	44	692.51	0.10	1.0	60	263	260	51	57	2
	9:28	48	694.659								

Notes:

SDS-21: HCl, Cl_2 by EPA Method 26A
Per EM SOP-021
Issued: April 2024
Document reviewed biennially

Project Name	Shamrock
Project Number	60751134
Date	3-27-25
Source	Oven INLET

Hydrogen Fluoride
EPA Method 26A

Condition No.	1
Run No.	1
Balance ID	BAL-M1503
Recovered by	CSY

Moisture Determination

Imp No.	Contents	Vol (mL)	Configuration	Initial Wt (g)	Final Wt (g)
1 [a]	0.1 N H_2SO_4	50	Knockout	—	—
2	0.1 N H_2SO_4	100	G/S	749.6	750.0
3	0.1 N H_2SO_4	100	G/S	723.1	723.6
4	Empty	0	Mod	598.1	599.2
5	Silica Gel	~300g	Mod	833.9	839.4

[a] this impinger optional, per Method 26A

Sample Recovery Checklist

✓ (Only if transfer line is used). Disconnect transfer line, and rinse three times with DI water into acid impinger catch bottle. Transfer bottle to laboratory with impinger train.

✓ Using water, rinse filter support, back half of filter holder and any connecting glassware into the acid impinger catch bottle.

✓ Disassemble sample train, wipe off excess water and weigh each impinger. Record the final weights in the Moisture Determination section of this data sheet.

Note condition of the silica gel impinger. 15 % spent

✓ Pour contents of the 1st, 2nd and 3rd (containing acid) impingers into the Acid impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete acid impinger sample label.

✓ Log samples into logbook and store appropriately.

Notes:

Sample Log

Sample ID Number	Sample Container	Description
-M26A-AcdImp	1 L Nalgene	Acid Impinger Catch & Rinse

RDS-19: HCl/Cl_2 by EPA Method 26A
Per EM SOP-021
Issued: March 2024
Document reviewed biennially

Sample Type	26A	Date	03/27/2025	Barometer ID	NWS	Page 1 of 1
Project Name	~~684~~ Shamrock HF Eng.	Cond: 1	Run: 2	Bar. Press. ("Hg)	29.78	**Train Leak Rate** (cfm @ "Hg)
Project Number	60751134	Console ID	SC-M1540	Stat. Press. ("H_2O)	-6.5	Initial 0.000 @ 15"
Facility	Shamrock KY	DGMCF	1.007	Probe ID	IP-M0405	Final 0.000 @ 10"
Source	Oven- Inlet	ΔH@ 1.765	K_f 10.4	PTCF	0.84	**Pitot Tube Leak Check** ("H_2O@"H_2O)
Operator	JY			Meter Elevation (ft) (relative to Barometer)	0	Initial (-) 0.0 @ 5.6
Duct Dimension(s)	17"	Nozzle Dia (in)	0.314			Initial (+) 0.0 @ 6.2
Nozzle Calibration	0,314 0,314 0,317	Caliper Used	ID			Final (-) 0.0 @ 5.4
			Calibration Exp Date			Final (+) 0.0 @ 5.5

Post-Test Stack TC Check	Reference Thermometer ID	Ref Thermometer Exp Date	Thermometer and TC agree within 2°F **Y / N**	Post-Test: Are Pitots Damaged? Y [✓ N]

Point	Clock Time	Elapsed Time (optional)	DGM Reading (ft³)	ΔP ("H_2O)	ΔH ("H_2O)	Temperature (°F)					Vacuum ("Hg)
						Stack	Probe (248-273)	Filter (248-273)	Imp Exit (<68)	DGM Outlet	
A-1	9:44	0	694.815	0.18	1.9	90	259	259	52	59	4
2	9:48	4	697.77	0.20	2.1	92	262	261	51	59	4.5
3	9:52	8	700.79	0.23	2.4	94	263	261	50	59	5
4	9:56	12	704.04	0.23	2.4	85	259	262	52	59	5
5	10:00	16	707.29	0.18	1.9	74	261	259	52	60	4
6	10:04	20	710.21	0.35	3.6	77	259	262	52	60	7
port change	10:08		714.087								
B-1	10:13	24	714.087	0.15	1.6	91	260	258	54	60	3
2	10:17	28	716.75	0.18	1.9	101	261	258	53	60	4
3	10:21	32	719.61	0.20	2.1	98	258	259	53	60	4.5
4	10:25	36	722.61	0.20	2.1	101	259	258	52	60	4.5
5	10:29	40	725.60	0.18	1.9	102	260	260	53	61	4
6	10:33	44	728.48	0.18	1.9	103	259	260	53	61	4
	10:37	48	731.314								

Notes:

***SDS-21**: HCl, Cl_2 by EPA Method 26A*
***Per** EM SOP-021*
***Issued:** April 2024*
Document reviewed biennially

Project Name	Shamrock
Project Number	60751134
Date	3-27-25
Source	OVEN - INLET

Hydrogen Fluoride
EPA Method 26A

Condition No.	1
Run No.	2
Balance ID	BAL-M1503
Recovered by	CJT

Moisture Determination

Imp No.	Contents	Vol (mL)	Configuration	Initial Wt (g)	Final Wt (g)
1 [a]	0.1 N H_2SO_4	50	Knockout	—	—
2	0.1 N H_2SO_4	100	G/S	720.9	721.5
3	0.1 N H_2SO_4	100	G/S	754.9	755.2
4	Empty	0	Mod	653.3	654.3
5	Silica Gel	~ 300g	Mod	881.2	~~846.0~~ *
					886.1

[a] this impinger optional, per Method 26A

Sample Recovery Checklist

✓ (Only if transfer line is used). Disconnect transfer line, and rinse three times with DI water into acid impinger catch bottle. Transfer bottle to laboratory with impinger train.

✓ Using water, rinse filter support, back half of filter holder and any connecting glassware into the acid impinger catch bottle.

✓ Disassemble sample train, wipe off excess water and weigh each impinger. Record the final weights in the Moisture Determination section of this data sheet.

Note condition of the silica gel impinger. 65 % spent

✓ Pour contents of the 1st, 2nd and 3rd (containing acid) impingers into the Acid impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete acid impinger sample label.

✓

Log samples into logbook and store appropriately.

Notes:	CT 3-26-25

Sample Log

Sample ID Number	Sample Container	Description
-M26A-AcdImp	1 L Nalgene	Acid Impinger Catch & Rinse

RDS-19: HCl/Cl_2 by EPA Method 26A
Per EM SOP-021
Issued: March 2024
Document reviewed biennially

Sample Type 2CA	Date 03/27/2025	Barometer ID NVS	Page 1 of 1
Project Name Shamrock HF Ens.	Cond: 1 / Run: 3	Bar. Press. ("Hg) 29.78	**Train Leak Rate** (cfm @ "Hg)
Project Number 60751134	Console ID SC-M1540	Stat. Press. ("H_2O) -6.5	Initial 0.000 @ 15"
Facility Shamrock KY	DGMCF 1.007	Probe ID IP-M0405	Final 0.000 @ 12"
Source Oven-Inlet	ΔH@ 1.765 / K_f 10.4	PTCF 0.84	**Pitot Tube Leak Check** ("H_2O@"H_2O)
Operator JY		Meter Elevation (ft) (relative to Barometer) 0	Initial (-) 0.0 @ 5.6
Duct Dimension(s) 17"	Nozzle Dia (in) 0.314		Initial (+) 0.0 @ 6.2
Nozzle Calibration 0.314 0.314 0.314	Caliper Used	ID	Final (-) 0.0 @ 6.0
		Calibration Exp Date	Final (+) 0.0 @ 5.5

Post-Test Stack TC Check Reference Thermometer ID

Ref Thermometer Exp Date

Thermometer and TC agree within 2°F **Y / N**

Post-Test: Are Pitots Damaged? **Y / N**

Point	**Clock Time**	**Elapsed Time** (optional)	**DGM Reading** (ft³)	**ΔP** ("H_2O)	**ΔH** ("H_2O)	**Temperature** (°F)					**Vacuum** ("Hg)
						Stack	**Probe** (248-273)	**Filter** (248-273)	**Imp Exit** (<68)	**DGM Outlet**	
A-1	10:54	0	731.445	0.25	2.6	107	261	260	54	60	5
2	10:58	4	734.87	0.30	3.1	110	257	258	53	60	5.5
3	11:02	8	738.52	0.32	3.3	111	261	260	57	61	6
4	11:06	12	742.30	0.32	3.3	111	259	260	58	61	6
5	11:10	16	746.05	0.29	3.0	111	260	260	59	61	5.5
6	11:14	20	749.71	0.36	3.7	114	259	260	59	61	7
port change	11:18		753.733								
B-1	11:22	24	753.733	0.21	2.2	108	265	261	59	61	5
2	11:26	28	756.91	0.25	2.6	120	260	258	58	61	5.5
3	11:30	32	760.30	0.30	3.1	120	260	260	57	61	6.5
4	11:34	36	763.92	0.30	3.1	119	258	260	58	62	6.5
5	11:38	40	767.47	0.25	2.6	105	260	260	60	62	6
6	11:42	44	770.89	0.25	2.6	95	259	259	59	62	6
	11:46	48	774.281								

Notes:

SDS-21: HCl, Cl_2 by EPA Method 26A
Per EM SOP-021
***Issued:** April 2024*
Document reviewed biennially

Project Name	Shamrock
Project Number	60751134
Date	3-27-25
Source	OVEN - INLET

Hydrogen Fluoride

EPA Method 26A

Condition No.	1
Run No.	3
Balance ID	BAL-M1503
Recovered by	CJT

Moisture Determination

Imp No.	Contents	Vol (mL)	Configuration	Initial Wt (g)	Final Wt (g)
1 [a]	0.1 N H_2SO_4	50	Knockout	—	—
2	0.1 N H_2SO_4	100	G/S	740.0	737.9
3	0.1 N H_2SO_4	100	G/S	768.5	764.0
4	Empty	0	Mod	669.5	671.1
5	Silica Gel	~ 300g	Mod	867.6	875.8

[a] this impinger optional, per Method 26A

Sample Recovery Checklist

✓ (Only if transfer line is used). Disconnect transfer line, and rinse three times with DI water into acid impinger catch bottle. Transfer bottle to laboratory with impinger train.

✓ Using water, rinse filter support, back half of filter holder and any connecting glassware into the acid impinger catch bottle.

✓ Disassemble sample train, wipe off excess water and weigh each impinger. Record the final weights in the Moisture Determination section of this data sheet.

Note condition of the silica gel impinger. 15 % spent

✓ Pour contents of the 1st, 2nd and 3rd (containing acid) impingers into the Acid impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete acid impinger sample label.

✓

____ Log samples into logbook and store appropriately.

Notes:

Sample Log

Sample ID Number	Sample Container	Description
-M26A-AcdImp	1 L Nalgene	Acid Impinger Catch & Rinse

RDS-19: HCl/Cl_2 by EPA Method 26A
Per EM SOP-021
Issued: March 2024
Document reviewed biennially

Sample Type	26A	Date	3/27/25	Barometer ID	NWS
Project Name	Shamrock HF erg	Cond: ~~Norm~~/ 1	Run: 1	Bar. Press. ("Hg)	29.78
Project Number	60751134	Console ID	SC-M1533	Stat. Press. ("H_2O)	+ 1.5
Facility	Henderson	DGMCF	.972	Probe ID	M0609
Source	Oven Outlet	ΔH@ 1.886	K_f 2.66	PTCF	.84
Operator	JMA			Meter Elevation (ft) (relative to Barometer)	0
Duct Dimension(s)	21"	Nozzle Dia (in)	.218		

Page of

Train Leak Rate (cfm @ "Hg)

Initial .001 @ 15"

Final .001 @ 7"

Pitot Tube Leak Check ("H_2O@"H_2O)

Initial (-) 0.0 @ 8

Initial (+) 0.0 @ 8

Final (-) 0.0 @ 8

Final (+) 0.0 @ 8

Nozzle Calibration ○ .218 ○ .218 ○ .218

Caliper Used ID

Calibration Exp Date

Post-Test Stack TC Check Reference Thermometer ID

Ref Thermometer Exp Date

Thermometer and TC agree within 2°F **Y / N**

Post-Test: Are Pitots Damaged? **Y / [✓ N]**

Point	Clock Time	Elapsed Time (optional)	DGM Reading (ft³)	ΔP ("H_2O)	ΔH ("H_2O)	Temperature (°F) Stack	Probe (248-273)	Filter (248-273)	Imp Exit (<68)	DGM Outlet	Vacuum ("Hg)
B-1	0835	0	348.800	.37	.98	52	253	272	46	49	4
2		4	351.080	.35	.93	52	266	254	47	49	4
3		8	353.148	.36	.96	53	253	269	47	50	4
4		12	355.326	.40	1.06	53	255	256	47	50	4
5		16	357.648	.48	1.28	53	263	271	48	51	4
6		20	360.144	.37	.98	53	255	272	47	51	4
A-1	0859/0904	24	362.388	.39	1.04	54	267	261	48	52	4
2		28	364.665	.36	.96	55	251	272	49	53	4
3		32	366.855	.38	1.01	54	262	255	48	53	4
4		36	369.115	.42	1.12	53	260	261	48	53	4
5		40	371.483	.44	1.17	53	251	272	49	53	4
6		44	373.880	.29	.77	53	260	270	49	53	4
	0928	48	375.890								

Notes:

SDS-21: HCl, Cl_2 by EPA Method 26A
Per EM SOP-021
Issued: April 2024
Document reviewed biennially

Project Name	Shamrock
Project Number	60751134
Date	3-27-25
Source	OVEN Outlet

Hydrogen Fluoride
EPA Method 26A

Condition No.	1
Run No.	1
Balance ID	BAL-M1503
Recovered by	CJT

Moisture Determination

Imp No.	Contents	Vol (mL)	Configuration	Initial Wt (g)	Final Wt (g)
1[a]	0.1 N H_2SO_4	50	Knockout	—	—
2	0.1 N H_2SO_4	100	G/S	694.9	696.5
3	0.1 N H_2SO_4	100	G/S	694.8	695.9
4	Empty	0	Mod	661.7	662.2
5	Silica Gel	~ 300g	Mod	843.7	848.8

[a] this impinger optional, per Method 26A

Sample Log

Sample ID Number	Sample Container	Description
-M26A-AcdImp	1 L Nalgene	Acid Impinger Catch & Rinse

Sample Recovery Checklist

_____ (Only if transfer line is used). Disconnect transfer line, and rinse three times with DI water into acid impinger catch bottle. Transfer bottle to laboratory with impinger train.

_____ Using water, rinse filter support, back half of filter holder and any connecting glassware into the acid impinger catch bottle.

_____ Disassemble sample train, wipe off excess water and weigh each impinger. Record the final weights in the Moisture Determination section of this data sheet.

Note condition of the silica gel impinger. ____% spent

_____ Pour contents of the 1st, 2nd and 3rd (containing acid) impingers into the Acid impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete acid impinger sample label.

_____

_____ Log samples into logbook and store appropriately.

Notes:

RDS-19: HCl/Cl_2 by EPA Method 26A
Per EM SOP-021
***Issued:** March 2024*
Document reviewed biennially

Sample Type: M26A
Project Name: Shamrock HF eng.
Project Number: 60751134
Facility: Henderson
Source: Oven outlet
Operator: JMA
Duct Dimension(s): 21"

Date: 3/27/25
Cond: ~~[illegible]~~ 1
Run: 2
Console ID: SC-M1533
DGMCF: .972
ΔH@ 1.886
K_f 2.66
Nozzle Dia (in): .218

Barometer ID: NWS
Bar. Press. ("Hg): 29.80
Stat. Press. ("H_2O): +~~1.5~~ 2.0
Probe ID: M0609
PTCF: .84
Meter Elevation (ft) (relative to Barometer): 0

Page of

Train Leak Rate (cfm @ "Hg)
Initial: .001 @ 15"
Final: .001 @ 7"

Pitot Tube Leak Check ("H_2O@"H_2O)
Initial (-): 0 @ 8
Initial (+): 0 @ 8
Final (-): 0 @ 8
Final (+): 0 @ 7

Nozzle Calibration: .218 .218 .218
Caliper Used
ID
Calibration Exp Date

Post-Test Stack TC Check
Reference Thermometer ID
Ref Thermometer Exp Date
Thermometer and TC agree within 2°F: Y / N
Post-Test: Are Pitots Damaged? Y / [✓ N]

Point	Clock Time	Elapsed Time (optional)	DGM Reading (ft³)	ΔP ("H_2O)	ΔH ("H_2O)	Temperature (°F) Stack	Probe (248-273)	Filter (248-273)	Imp Exit (<68)	DGM Outlet	Vacuum ("Hg)
A-1	944	0	376.200	.41	1.09	55	264	251	47	55	4
2		4	378.580	.45	1.20	55	253	270	46	54	4
3		8	381.023	.42	1.12	55	264	254	46	55	4
4		12	383.421	.42	1.12	54	254	271	47	55	4
5		16	385.825	.45	1.20	55	261	254	49	55	4
6		20	388.268	.35	.93	54	262	254	49	55	4
B-1	1008/1013	24	390.433	.37	.98	55	253	268	48	56	4
2		28	392.664	.38	1.01	55	269	268	49	56	4
3		32	394.927	.40	1.06	55	251	270	49	56	4
4		36	397.265	.44	1.17	54	260	261	49	56	4
5		40	399.672	.37	.98	55	253	269	49	56	4
6		44	401.920	~~.34~~ .38	1.01	55	254	267	50	56	4
	1037	48	404.175								

Notes:

SDS-21: HCl, Cl_2 by EPA Method 26A
Per EM SOP-021
Issued: April 2024
Document reviewed biennially

Project Name	Shamrock
Project Number	60751134
Date	3-27-25
Source	OVEN - OUTLET

Hydrogen Fluoride
EPA Method 26A

Condition No.	1
Run No.	2
Balance ID	BAL-M1503
Recovered by	CJT

Moisture Determination

Imp No.	Contents	Vol (mL)	Configuration	Initial Wt (g)	Final Wt (g)
1 [a]	0.1 N H_2SO_4	50	Knockout	—	—
2	0.1 N H_2SO_4	100	G/S	687.9	689.4
3	0.1 N H_2SO_4	100	G/S	734.9	735.5
4	Empty	0	Mod	640.2	640.4
5	Silica Gel	~ 300g	Mod	846.0	851.2

[a] this impinger optional, per Method 26A

Sample Recovery Checklist

✓ (Only if transfer line is used). Disconnect transfer line, and rinse three times with DI water into acid impinger catch bottle. Transfer bottle to laboratory with impinger train.

✓ Using water, rinse filter support, back half of filter holder and any connecting glassware into the acid impinger catch bottle.

✓ Disassemble sample train, wipe off excess water and weigh each impinger. Record the final weights in the Moisture Determination section of this data sheet.

Note condition of the silica gel impinger. 15 % spent

✓ Pour contents of the 1st, 2nd and 3rd (containing acid) impingers into the Acid impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete acid impinger sample label.

✓

Log samples into logbook and store appropriately.

Notes:

Sample Log

Sample ID Number	Sample Container	Description
-M26A-AcdImp	1 L Nalgene	Acid Impinger Catch & Rinse

RDS-19: HCl/Cl_2 by EPA Method 26A
Per EM SOP-021
***Issued:** March 2024*
Document reviewed biennially

Sample Type	M26A	Date	3/27/25		Barometer ID	NWS	Page of
Project Name	Shamrock	Cond: ~~Normal~~ 1		Run: 3	Bar. Press. ("Hg)	29.80	**Train Leak Rate** (cfm @ "Hg)
Project Number	6075134	Console ID	SC-M1533		Stat. Press. ("H_2O)	+2.1	Initial .002 @ 15"
Facility	Henderson	DGMCF	.972		Probe ID	M0609	Final .001 @ 7"
Source	Oven outlet	ΔH@	1.886	K_f 2.66	PTCF	.84	**Pitot Tube Leak Check** ("H_2O@"H_2O)
Operator	JmA				Meter Elevation (ft) (relative to Barometer)	0	Initial (-) 0 @ 7
Duct Dimension(s)	21"	Nozzle Dia (in)					Initial (+) 0 @ 7
Nozzle Calibration	.218 .218 .218		Caliper Used	ID			Final (-) 0 @ 7
				Calibration Exp Date			Final (+) 0 @ 7

Post-Test Stack TC Check	Reference Thermometer ID	Ref Thermometer Exp Date	Thermometer and TC agree within 2°F	Y / N	Post-Test: Are Pitots Damaged? Y [✓ N]

Point	Clock Time	Elapsed Time (optional)	DGM Reading (ft³)	ΔP ("H_2O)	ΔH ("H_2O)	Temperature (°F) Stack	Probe (248-273)	Filter (248-273)	Imp Exit (<68)	DGM Outlet	Vacuum ("Hg)
B-1	1054	0	404.500	.38	1.01	57	257	268	51	56	4
2		4	406.742	.42	1.12	57	255	270	49	56	4
3		8	409.146	.44	1.17	58	251	256	50	56	4
4		12	411.570	.40	1.06	58	255	268	52	56	4
5		16	413.920	.45	1.20	58	251	271	53	56	4
6		20	416.343	.49	1.30	59	265	252	54	56	4
A-1	1118/1122	24	418.877	.45	1.20	62	252	271	56	57	4
2		28	421.276	.45	1.20	63	252	261	56	58	4
3		32	423.695	.44	1.17	62	258	272	57	57	4
4		36	426.110	.51	1.36	63	257	265	58	58	4
5		40	428.687	.40	1.06	64	251	261	59	58	4
6		44	431.045	.37	.98	63	256	268	60	58	4
	1146	48	433.270								

Notes:

SDS-21: HCl, Cl_2 by EPA Method 26A
Per EM SOP-021
Issued: April 2024
Document reviewed biennially

Project Name	Shamrock
Project Number	60751134
Date	3-27-25
Source	OVEN - OUTLET

Hydrogen Fluoride
EPA Method 26A

Condition No.	1
Run No.	3
Balance ID	BAL-M1503
Recovered by	CJT

Moisture Determination

Imp No.	Contents	Vol (mL)	Configuration	Initial Wt (g)	Final Wt (g)
1[a]	0.1 N H_2SO_4	50	Knockout	—	—
2	0.1 N H_2SO_4	100	G/S	631.5	633.4
3	0.1 N H_2SO_4	100	G/S	760.4	760.7
4	Empty	0	Mod	602.1	602.5
5	Silica Gel	~ 300g	Mod	840.8	846.4

[a] this impinger optional, per Method 26A

Sample Recovery Checklist

✓ (Only if transfer line is used). Disconnect transfer line, and rinse three times with DI water into acid impinger catch bottle. Transfer bottle to laboratory with impinger train.

✓ Using water, rinse filter support, back half of filter holder and any connecting glassware into the acid impinger catch bottle.

✓ Disassemble sample train, wipe off excess water and weigh each impinger. Record the final weights in the Moisture Determination section of this data sheet.

Note condition of the silica gel impinger. 15 % spent

✓ Pour contents of the 1st, 2nd and 3rd (containing acid) impingers into the Acid impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete acid impinger sample label.

✓

____ Log samples into logbook and store appropriately.

Notes:

Sample Log

Sample ID Number	Sample Container	Description
-M26A-AcdImp	1 L Nalgene	Acid Impinger Catch & Rinse

RDS-19: HCl/Cl₂ by EPA Method 26A
Per EM SOP-021
Issued: March 2024
Document reviewed biennially

Sample Type: **HF (Method 26A)**
Date: 03/28/2025
Barometer ID: NWS
Page 1 of 1

Project Name: **Shamrock**
Cond: 2
Run: 1
Bar. Press. ("Hg): 29.63

Train Leak Rate (cfm @ "Hg)
Initial: 0.001 @ 15"
Final: 0.000 @ 16"

Project Number: **60751134**
Console ID: SC-M1540
Stat. Press. ("H_2O): -6.5

Facility: **Henderson, KY**
DGMCF: 1.007
Probe ID: IP-M0405

Source: Oven - Inlet
ΔH@: 1.765
K_f: 9.64
PTCF: 0.84

Pitot Tube Leak Check ("H_2O@"H_2O)
Initial (-): 0.0 @ 5.6
Initial (+): 0.0 @ 6.2
Final (-): 0.0 @ 5.4
Final (+): 0.0 @ 5.8

Operator: JY
Meter Elevation (ft) (relative to Barometer): 0
Duct Dimension(s): 17"
Nozzle Dia (in): 0.314

Nozzle Calibration: 0.314 0.314 0.314
Caliper Used
ID:
Calibration Exp Date:

Post-Test Stack TC Check
Reference Thermometer ID:
Ref Thermometer Exp Date:
Thermometer and TC agree within 2°F **Y / N**
Post-Test: Are Pitots Damaged? **Y / N**

Point	**Clock Time**	**Elapsed Time** (optional)	**DGM Reading** (ft³)	**ΔP** ("H_2O)	**ΔH** ("H_2O)	**Temperature** (°F)					**Vacuum** ("Hg)
						Stack	**Probe** (248-273)	**Filter** (248-273)	**Imp Exit** (<68)	**DGM Outlet**	
A-1	7:51	0	774.545	0.11	1.1	105	261	261	64	66	3
2	7:55	4	776.83	0.12	1.2	107	257	258	58	67	4
3	7:59	8	779.07	0.14	1.3	110	258	261	56	67	5
4	8:03	12	781.42	0.24	2.3	86	260	260	56	67	10
5	8:07	16	784.41	0.24	2.3	85	261	261	55	67	~~11~~ 13 JY
6	8:11	20	787.39	0.25	2.4	106	260	261	58	68	14
port change	8:15		790.308								
B-1	8:23	24	~~790.308~~ 790.563 JY	0.15	1.4	107	258	256	62	69	2.5
2	8:27	28	793.06	0.18	1.7	108	254	258	56	69	5
3	8:31	32	795.65	0.21	2.0	110	262	261	57	71	7.5
4	8:35	36	798.56	0.27	2.6	113	261	261	58	70	11
5	8:39	40	801.78	0.21	2.0	114	256	260	59	72	10.5
6	8:43	44	804.68	0.18	1.7	115	260	259	60	72	10
	8:47	48	807.398								

Notes: filter change at 8:15, leak checked good before and after filter change.

SDS-21: HCl, Cl_2 by EPA Method 26A
***Per** EM SOP-021*
***Issued:** April 2020*
Document reviewed biennially

Project Name	Shamrock
Project Number	60751134
Date	2-28-25
Source	OVEN - INLET

Hydrogen Fluoride

EPA Method 26A

Condition No.	2
Run No.	1
Balance ID	BAL-M1503
Recovered by	CJT

Moisture Determination

Imp No.	Contents	Vol (mL)	Configuration	Initial Wt (g)	Final Wt (g)
1[a]	0.1 N H_2SO_4	50	Knockout	–	–
2	0.1 N H_2SO_4	100	G/S	747.4	247.9
3	0.1 N H_2SO_4	100	G/S	726.7	726.2
4	Empty	0	Mod	599.1	599.7
5	Silica Gel	~300g	Mod	834.4	846.1

[a] this impinger optional, per Method 26A

Sample Recovery Checklist

✓ (Only if transfer line is used). Disconnect transfer line, and rinse three times with DI water into acid impinger catch bottle. Transfer bottle to laboratory with impinger train.

✓ Using water, rinse filter support, back half of filter holder and any connecting glassware into the acid impinger catch bottle.

✓ Disassemble sample train, wipe off excess water and weigh each impinger. Record the final weights in the Moisture Determination section of this data sheet.

Note condition of the silica gel impinger. 20 % spent

✓ Pour contents of the 1st, 2nd and 3rd (containing acid) impingers into the Acid impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete acid impinger sample label.

✓ Pour the contents of the 4th and 5th impingers (containing NaOH) into the alkaline impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete alkaline impinger sample label.

_____ Log samples into logbook and store appropriately.

Sample Log

Sample ID Number	Sample Container	Description
-M26A-AcdImp	1 L Nalgene	Acid Impinger Catch & Rinse

Notes:

RDS-19: HCl/Cl_2 by EPA Method 26A
Per EM SOP-021
***Issued**: March 2020*
Document reviewed biennially

Sample Type	**HF (Method 26A)**	Date	03/28/2025		Barometer ID	MWS	Page 1 of 1
Project Name	**Shamrock**	Cond	2	Run 2	Bar. Press. ("Hg)	29.62	**Train Leak Rate** (cfm @ "Hg)
Project Number	**60751134**	Console ID	SC-M1540		Stat. Press. ("H_2O)	-6.5	Initial 0.000 @ 16"
Facility	**Henderson, KY**	DGMCF	1.007		Probe ID	IP-M0405	Final 0.000 @ 20"
Source	Oven - Inlet	ΔH@	1.765	K_f 9.64	PTCF	0.84	**Pitot Tube Leak Check** ("H_2O@"H_2O)
Operator	JY				Meter Elevation (ft) (relative to Barometer)	0	Initial (-) 0.0 @ 5.6
Duct Dimension(s)	17"	Nozzle Dia (in)	0.314				Initial (+) 0.0 @ 5.4
Nozzle Calibration	0.314 0.314 0.314	Caliper Used			ID		Final (-) 0.0 @ 6.1
					Calibration Exp Date		Final (+) 0.0 @ 6.2

Post-Test Stack TC Check	Reference Thermometer ID		Ref Thermometer Exp Date		Thermometer and TC agree within 2°F	**Y / N**	Post-Test: Are Pitots Damaged? **Y / N**

Point	Clock Time	Elapsed Time (optional)	DGM Reading (ft³)	ΔP ("H_2O)	ΔH ("H_2O)	Temperature (°F) Stack	Probe (248-273)	Filter (248-273)	Imp Exit (<68)	DGM Outlet	Vacuum ("Hg)
A-1	9:06	0	807.587	0.15	1.4	116	263	260	63	73	3
2	9:10	4	809.98	0.17	1.6	119	255	259	63	73	5.5
3	9:14	8	812.52	0.20	1.9	119	259	259	60	75	8
4	9:18	12	815.30	0.25	2.4	121	260	261	59	75	12
5	9:22	16	818.39	0.22	2.1	123	260	260	60	76	12
6	9:26	20	821.31	0.20	1.9	124	260	261	61	75	12
port change	9:30	2	824.076								
B-1	9:37	24	824.421	0.15	1.4	119	259	259	62	76	3
2	9:41	28	826.84	0.19	1.8	123	256	259	61	76	5
3	9:45	32	829.58	0.22	2.1	125	259	259	61	77	7
4	9:49	36	832.46	0.31	3.0	109	260	261	61	77	11
5	9:53	40	835.95	0.26	2.5	105	260	261	61	77	13
6	9:57	44	839.23	0.25	2.4	105	261	260	63	78	14
	10:01	48	842.341								

Notes: filter change at 9:30. leak checked good before and after filter change.

SDS-21: HCl, Cl_2 by EPA Method 26A
Per EM SOP-021
Issued: April 2020
Document reviewed biennially

Project Name	Shamrock
Project Number	60751134
Date	3-28-25
Source	OVEN - INLET

Hydrogen Fluoride
EPA Method 26A

Condition No.	2
Run No.	2
Balance ID	BAL-M1503
Recovered by	CJT

Moisture Determination

Imp No.	Contents	Vol (mL)	Configuration	Initial Wt (g)	Final Wt (g)
1 [a]	0.1 N H_2SO_4	50	Knockout	—	—
2	0.1 N H_2SO_4	100	G/S	721.6	721.2
3	0.1 N H_2SO_4	100	G/S	754.0	754.6
4	Empty	0	Mod	654.2	655.4
5	Silica Gel	~300g	Mod	886.3	841.7

[a] this impinger optional, per Method 26A

Sample Recovery Checklist

✓ (Only if transfer line is used). Disconnect transfer line, and rinse three times with DI water into acid impinger catch bottle. Transfer bottle to laboratory with impinger train.

✓ Using water, rinse filter support, back half of filter holder and any connecting glassware into the acid impinger catch bottle.

✓ Disassemble sample train, wipe off excess water and weigh each impinger. Record the final weights in the Moisture Determination section of this data sheet.

Note condition of the silica gel impinger. 20 % spent

✓ Pour contents of the 1st, 2nd and 3rd (containing acid) impingers into the Acid impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete acid impinger sample label.

✓ Pour the contents of the 4th and 5th impingers (containing NaOH) into the alkaline impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete alkaline impinger sample label.

____ Log samples into logbook and store appropriately.

Sample Log

Sample ID Number	Sample Container	Description
-M26A-AcdImp	1 L Nalgene	Acid Impinger Catch & Rinse

Notes:

Sample Type	**HF (Method 26A)**	Date	03/28/2025	Barometer ID	NWS
Project Name	**Shamrock**	Cond 2	Run 3	Bar. Press. ("Hg)	29.63
Project Number	**60751134**	Console ID	SC-M1540	Stat. Press. ("H_2O)	-6.5
Facility	**Henderson, KY**	DGMCF	1.007	Probe ID	IP-M0405
Source	Oven - Inlet	ΔH@ 1.765	K_f 10.5	PTCF	0.84
Operator	JY			Meter Elevation (ft) (relative to Barometer)	0
Duct Dimension(s)	17"	Nozzle Dia (in)	0.314		

Page 1 of 1

Train Leak Rate (cfm @ "Hg)

Initial 0.000 @ 18"

Final 0.000 @ 18"

Pitot Tube Leak Check ("H_2O@"H_2O)

Initial (-) 0.0 @ 5.0

Initial (+) 0.0 @ 5.5

Final (-) 0.0 @ 6.2

Final (+) 0.0 @ 5.4

Nozzle Calibration 0.314 0.314 0.314

Caliper Used

ID

Calibration Exp Date

Post-Test Stack TC Check Reference Thermometer ID

Ref Thermometer Exp Date

Thermometer and TC agree within 2°F **Y / N**

Post-Test: Are Pitots Damaged? **Y / N**

Point	Clock Time	Elapsed Time (optional)	DGM Reading (ft³)	ΔP ("H_2O)	ΔH ("H_2O)	Temperature (°F) Stack	Probe (248-273)	Filter (248-273)	Imp Exit (<68)	DGM Outlet	Vacuum ("Hg)
A-1	10:17	0	842.574	0.17	1.8	126	262	260	65	79	5
2	10:21	4	845.36	0.21	2.2	133	258	259	63	80	8
3	10:25	8	848.28	0.23	2.4	136	261	259	61	80	11
4	10:29	12	851.40	0.21	2.2	116	260	258	61	80	13
5	10:33	16	854.38	0.23	2.4	104	259	261	61	80	14
6	10:37	20	857.30	0.21	2.2	91	260	260	60	81	15
post change	10:41		860.185								
B-1	10:48	24	860.531	0.16	1.7	130	255	258	64	83	3.5
2	10:52	28	863.55	0.19	2.0	133	256	258	61	83	6
3	10:56	32	866.45	0.21	2.2	135	260	259	61	83	8
4	11:00	36	869.42	0.26	2.7	135	261	261	60	83	12
5	11:04	40	872.67	0.23	2.4	135	260	261	61	84	13
6	11:08	44	875.74	0.21	2.2	136	264	262	62	86	14
	11:12	48	878.720								

Notes: filter change at 10:41

SDS-21: HCl, Cl_2 by EPA Method 26A
***Per** EM SOP-021*
***Issued:** April 2020*
Document reviewed biennially

Project Name	Shamrock
Project Number	60751134
Date	3-28-25
Source	OVEN - INLET

Hydrogen Fluoride
EPA Method 26A

Condition No.	2
Run No.	3
Balance ID	BAL-M1503
Recovered by	CJT

Moisture Determination

Imp No.	Contents	Vol (mL)	Configuration	Initial Wt (g)	Final Wt (g)
1[a]	0.1 N H_2SO_4	50	Knockout	—	—
2	0.1 N H_2SO_4	100	G/S	740.0	742.0
3	0.1 N H_2SO_4	100	G/S	769.0	769.4
4	Empty	0	Mod	670.3	671.5
5	Silica Gel	~300g	Mod	875.8	883.0

[a] this impinger optional, per Method 26A

Sample Log

Sample ID Number	Sample Container	Description
-M26A-AcdImp	1 L Nalgene	Acid Impinger Catch & Rinse

Sample Recovery Checklist

✓ (Only if transfer line is used). Disconnect transfer line, and rinse three times with DI water into acid impinger catch bottle. Transfer bottle to laboratory with impinger train.

✓ Using water, rinse filter support, back half of filter holder and any connecting glassware into the acid impinger catch bottle.

✓ Disassemble sample train, wipe off excess water and weigh each impinger. Record the final weights in the Moisture Determination section of this data sheet.

Note condition of the silica gel impinger. 20 % spent

✓ Pour contents of the 1st, 2nd and 3rd (containing acid) impingers into the Acid impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete acid impinger sample label.

✓ Pour the contents of the 4th and 5th impingers (containing NaOH) into the alkaline impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete alkaline impinger sample label.

____ Log samples into logbook and store appropriately.

Notes:

RDS-19: HCl/Cl_2 by EPA Method 26A
Per EM SOP-021
***Issued**: March 2020*
Document reviewed biennially

Sample Type	**HF (Method 26A)**	Date 3/28/25		Barometer ID NWS	Page	of
Project Name	**Shamrock**	Cond 2	Run 1	Bar. Press. ("Hg) 29.63	**Train Leak Rate** (cfm @ "Hg)	
Project Number	**60751134**	Console ID SC-M1533		Stat. Press. ("H_2O) + 1.65	Initial .001	@ 15"
Facility	**Henderson, KY**	DGMCF .972		Probe ID M0609	Final .001	@ 6"
Source	Oven Outlet	ΔH@ 1.886	K_f 2.7	PTCF .84	**Pitot Tube Leak Check** ("H_2O@"H_2O)	
Operator	JMA			Meter Elevation (ft) (relative to Barometer) 0	Initial (-) 0	@ 8
Duct Dimension(s)	21"	Nozzle Dia (in) .218			Initial (+) 0	@ 8
Nozzle Calibration	.218 .218 .218	Caliper Used	ID		Final (-) 0	@ 7
			Calibration Exp Date		Final (+) 0	@ 7
Post-Test Stack TC Check	Reference Thermometer ID	Ref Thermometer Exp Date		Thermometer and TC agree within 2°F **Y / N**	Post-Test: Are Pitots Damaged? **Y / N**	

Point	Clock Time	Elapsed Time (optional)	DGM Reading (ft³)	ΔP ("H_2O)	ΔH ("H_2O)	Temperature (°F)					Vacuum ("Hg)
						Stack	Probe (248-273)	Filter (248-273)	Imp Exit (<68)	DGM Outlet	
B - 1	0751	0	433.700	.37	1.00	66	268	251	59	60	4
2		4	435.965	.37	1.00	66	253	272	56	61	4
3		8	438.240	.38	1.03	67	255	265	57	62	4
4		12	440.520	.42	1.13	67	254	272	58	62	4
5		16	442.901	.44	1.19	68	255	270	60	62	5
6		20	445.350	.40	1.08	68	257	257	61	62	5
A - 1	0815/0823	24	447.717	.42	1.13	69	254	256	61	63	5
2		28	450.096	.42	1.13	69	258	256	60	64	5
3		32	452.471	.41	1.11	69	259	252	60	64	5
4		36	454.830	.38	1.03	70	256	267	61	65	5
5		40	457.142	.34	.92	70	256	272	62	65	5
6		44	459.301	.33	.89	69	255	258	62	66	5
	0847	48	461.463								

Notes: ~~2.66~~

SDS-21: HCl, Cl_2 by EPA Method 26A
***Per** EM SOP-021*
***Issued:** April 2020*
Document reviewed biennially

Project Name	Shamrock
Project Number	60751134
Date	3-28-25
Source	OVEN - OUTLET

Hydrogen Fluoride
EPA Method 26A

Condition No.	2
Run No.	1
Balance ID	BAL-M1503
Recovered by	C.T.

Moisture Determination

Imp No.	Contents	Vol (mL)	Configuration	Initial Wt (g)	Final Wt (g)
1 [a]	0.1 N H_2SO_4	50	Knockout	—	—
2	0.1 N H_2SO_4	100	G/S	694.4	695.8
3	0.1 N H_2SO_4	100	G/S	694.4	694.8
4	Empty	0	Mod	662.1	662.1
5	Silica Gel	~ 300g	Mod	848.8	854.0

[a] this impinger optional, per Method 26A

Sample Recovery Checklist

✓ (Only if transfer line is used). Disconnect transfer line, and rinse three times with DI water into acid impinger catch bottle. Transfer bottle to laboratory with impinger train.

✓ Using water, rinse filter support, back half of filter holder and any connecting glassware into the acid impinger catch bottle.

✓ Disassemble sample train, wipe off excess water and weigh each impinger. Record the final weights in the Moisture Determination section of this data sheet.

Note condition of the silica gel impinger. 20 % spent

✓ Pour contents of the 1st, 2nd and 3rd (containing acid) impingers into the Acid impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete acid impinger sample label.

✓ Pour the contents of the 4th and 5th impingers (containing NaOH) into the alkaline impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete alkaline impinger sample label.

____ Log samples into logbook and store appropriately.

Sample Log

Sample ID Number	Sample Container	Description
-M26A-AcdImp	1 L Nalgene	Acid Impinger Catch & Rinse

Notes:

Sample Type: **HF (Method 26A)**	Date: 3/28/25	Barometer ID: NWS	Page of
Project Name: **Shamrock**	Cond: 2 Run: 2	Bar. Press. ("Hg): 29.62	**Train Leak Rate** (cfm @ "Hg)
Project Number: **60751134**	Console ID: SC-M1533	Stat. Press. ("H_2O): + 1.65	Initial: .001 @ 15"
Facility: **Henderson, KY**	DGMCF: .972	Probe ID: M0609	Final: .001 @ 6"
Source: Oven Outlet	ΔH@: 1.886 K_f: 2.70	PTCF: .84	**Pitot Tube Leak Check** ("H_2O@"H_2O)
Operator: JMA		Meter Elevation (ft) (relative to Barometer): 0	Initial (-): 0 @ 7
Duct Dimension(s): 1.75 ft.	Nozzle Dia (in): .218		Initial (+): 0 @ 7
Nozzle Calibration: .218 .218 .218	Caliper Used	ID	Final (-): 0 @ 6
		Calibration Exp Date	Final (+): 0 @ 6

Post-Test Stack TC Check	Reference Thermometer ID	Ref Thermometer Exp Date	Thermometer and TC agree within 2°F **Y / N**	Post-Test: Are Pitots Damaged? **Y / N**

Point	Clock Time	Elapsed Time (optional)	DGM Reading (ft³)	ΔP ("H_2O)	ΔH ("H_2O)	Temperature (°F)					Vacuum ("Hg)
						Stack	Probe (248-273)	Filter (248-273)	Imp Exit (<68)	DGM Outlet	
A-1	0906	0	461.800	.41	1.11	72	252	265	65	66	5
2		4	464.149	.41	1.11	73	253	267	64	66	5
3		8	466.516	.40	1.08	73	257	271	64	67	5
4		12	468.890	.44	1.19	73	261	260	59	68	5
5		16	471.279	.36	.97	73	262	256	56	68	5
6		20	473.525	.32	.86	74	259	271	55	68	5
B-1	0930/0937	24	475.643	.40	1.08	76	252	255	60	69	5
2		28	477.995	.44	1.19	77	254	267	55	69	5
3		32	480.394	.42	1.13	76	251	268	55	69	5
4		36	482.790	.45	1.22	76	253	271	56	69	5
5		40	485.272	.37	1.00	77	255	270	56	70	5
6		44	487.569	.33	.89	76	253	260	57	70	5
	1001	48	489.723								

Notes:

Project Name	Shamrock
Project Number	60751134
Date	3-28-25
Source	OVEN - OUTLET

Hydrogen Fluoride
EPA Method 26A

Condition No.	2
Run No.	2
Balance ID	BAL-M1503
Recovered by	CJT

Moisture Determination

Imp No.	Contents	Vol (mL)	Configuration	Initial Wt (g)	Final Wt (g)
1 [a]	0.1 N H_2SO_4	50	Knockout	—	—
2	0.1 N H_2SO_4	100	G/S	688.0	692,4
3	0.1 N H_2SO_4	100	G/S	734.5	734.4
4	Empty	0	Mod	640.0	640.7
5	Silica Gel	~ 300g	Mod	851.2	856.5

[a] this impinger optional, per Method 26A

Sample Recovery Checklist

✓ (Only if transfer line is used). Disconnect transfer line, and rinse three times with DI water into acid impinger catch bottle. Transfer bottle to laboratory with impinger train.

✓ Using water, rinse filter support, back half of filter holder and any connecting glassware into the acid impinger catch bottle.

✓ Disassemble sample train, wipe off excess water and weigh each impinger. Record the final weights in the Moisture Determination section of this data sheet.

Note condition of the silica gel impinger. 20 % spent

✓ Pour contents of the 1st, 2nd and 3rd (containing acid) impingers into the Acid impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete acid impinger sample label.

✓ Pour the contents of the 4th and 5th impingers (containing NaOH) into the alkaline impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete alkaline impinger sample label.

_____ Log samples into logbook and store appropriately.

Sample Log

Sample ID Number	Sample Container	Description
-M26A-AcdImp	1 L Nalgene	Acid Impinger Catch & Rinse

Notes:

RDS-19: *HCl/Cl_2 by EPA Method 26A*
Per EM SOP-021
Issued: *March 2020*
Document reviewed biennially

Sample Type	**HF (Method 26A)**	Date 3/28/25		Barometer ID NWS	Page of
Project Name	**Shamrock**	Cond 2	Run 3	Bar. Press. ("Hg) 29.63	**Train Leak Rate (cfm @ "Hg)**
Project Number	**60751134**	Console ID SC-M1533		Stat. Press. ("H_2O) + 1.6	Initial .001 @ 15"
Facility	**Henderson, KY**	DGMCF .972		Probe ID M0609	Final .001 @ 6"
Source	Oven Outlet	ΔH@ 1.886	K_f 2.7	PTCF .84	**Pitot Tube Leak Check ("H_2O@"H_2O)**
Operator	JMA			Meter Elevation (ft) (relative to Barometer) 0	Initial (-) 0 @ 9
Duct Dimension(s)	21"	Nozzle Dia (in) .218			Initial (+) 0 @ 9
Nozzle Calibration	.218 .218 .218	Caliper Used	ID		Final (-) 0 @ 8
			Calibration Exp Date		Final (+) 0 @ 8

Post-Test Stack TC Check	Reference Thermometer ID	Ref Thermometer Exp Date	Thermometer and TC agree within 2°F	**Y / N**	Post-Test: Are Pitots Damaged? **Y / N**

Point	**Clock Time**	**Elapsed Time** (optional)	**DGM Reading** (ft^3)	**ΔP** ("H_2O)	**ΔH** ("H_2O)	**Temperature (°F)**					**Vacuum** ("Hg)
						Stack	**Probe** (248-273)	**Filter** (248-273)	**Imp Exit** (<68)	**DGM Outlet**	
B-1	1017	0	490.000	.37	1.00	80	255	259	65	72	4
2		4	492.272	.37	1.00	81	253	271	64	73	4
3		8	494.556	.41	1.11	79	263	265	63	73	4
4		12	496.960	~~4~~.37	1.00	78	251	267	58	74	4
5		16	499.264	.34	.92	79	255	270	57	74	4
6		20	501.440	.32	.86	79	258	255	56	74	4
A-1	1041/1048	24	503.550	.38	1.03	81	257	255	64	76	4
2		28	505.875	.38	1.03	81	262	270	56	76	4
3		32	508.190	.42	1.13	81	255	256	55	76	4
4		36	510.601	.39	1.05	82	255	255	55	76	4
5		40	512.930	.35	.95	82	257	270	55	77	4
6		44	515.162	.34	.92	83	264	255	56	77	4
	1112	48	517.364								

Notes:

SDS-21: HCl, Cl_2 by EPA Method 26A
Per EM SOP-021
Issued: April 2020
Document reviewed biennially

Project Name	Shamrock
Project Number	60751134
Date	3-28-25
Source	OVEN -OUTLET

Hydrogen Fluoride
EPA Method 26A

Condition No.	2
Run No.	3
Balance ID	BAL-M1503
Recovered by	CJT

Moisture Determination

Imp No.	Contents	Vol (mL)	Configuration	Initial Wt (g)	Final Wt (g)
1 [a]	0.1 N H_2SO_4	50	Knockout	—	—
2	0.1 N H_2SO_4	100	G/S	631.7	637.0
3	0.1 N H_2SO_4	100	G/S	759.3	759.7
4	Empty	0	Mod	603.0	603.6
5	Silica Gel	~ 300g	Mod	846.4	851.3

[a] this impinger optional, per Method 26A

Sample Recovery Checklist

✓ (Only if transfer line is used). Disconnect transfer line, and rinse three times with DI water into acid impinger catch bottle. Transfer bottle to laboratory with impinger train.

✓ Using water, rinse filter support, back half of filter holder and any connecting glassware into the acid impinger catch bottle.

✓ Disassemble sample train, wipe off excess water and weigh each impinger. Record the final weights in the Moisture Determination section of this data sheet.

Note condition of the silica gel impinger. 20 % spent

✓ Pour contents of the 1st, 2nd and 3rd (containing acid) impingers into the Acid impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete acid impinger sample label.

✓ Pour the contents of the 4th and 5th impingers (containing NaOH) into the alkaline impinger catch bottle(s). Rinse impingers and connecting glassware with deionized water into the same bottle(s). Complete alkaline impinger sample label.

_____ Log samples into logbook and store appropriately.

Sample Log

Sample ID Number	Sample Container	Description
`-M26A-AcdImp	1 L Nalgene	Acid Impinger Catch & Rinse

Notes:

RDS-19: HCl/Cl₂ by EPA Method 26A
Per EM SOP-021
Issued: March 2020
Document reviewed biennially

CEMs Operation Log (Project Setup)

Project	Shamrock
Project Number	60751134
Facility	Henderson, KY
Date	3-25-25 →

Page	1 of 1
Operator	CJT
Source 1	OVENS
Source 2	-

Calibration Gases

Component(s) [1]	Supplier [2]	Concentration(s)	Cylinder ID	Cylinder Exp Date
N_2	AG	100%	UHP	—
O_2 - CO_2	AG	10.01 - 10.15	CC464885	9-30-32
O_2 - CO_2	AG	22.10 - 20,25	XC006567B	5-13-32

[1] Indicate multi-component standards appropriately

[2] Code: AG Airgas; AL-Air Liquide; S-Scott; P-Praxair

Instrument Identification

Analyte	Manufacturer [3]	Model Number	Instrument Name or Serial Number	Instrument Status [4]
O_2	C	600	SN: D09011-M	1
CO_2	C	600	SN: D09011-M	1

[3] Code: T-Thermo; W-Western; C-California; S-Servomex; O-Omega; V-Vig

[4] Code: O1: On Line, Source 1; O2: On-Line, Source 2, CS: Cold Standby; HS: Hot Standby

Method Performance Checks

Activity	Method	Criterion	Check
Span Selection	3A, 6C, 7E, 10	Emissions between 20% and 100% of calibration span	CT
	25A	Span 1.5-2.5 times the emission limit; if no emission limit, span 1.5-2.5 times expected level	—
Calibration Gas Selection	3A, 6C, 7E, 10	Protocol gas; calibration span, 40-60% of calibration span, and <20% of calibration span (or zero gas)	CT
	25A	Protocol gas: 25-35%, 45-55% and 80-90% of span, zero grade air	—
Converter Check	7E	≥90% converter efficiency	—
Response Time	3A, 6C, 7E, 10, 25A	No criteria; evaluated to determine duration at sample points	—
Stratification Check [5,6]	3A, 6C, 7E, 10	See specifications on Stratification Check Data Sheet	—

[5] The stratification check criteria do not apply to RATA.

[5] The stratification check is not required for stacks or ducts <4 inches in diameter

CEMS Operation Log (Daily)

Project Name	Shamrock	Page	of
Project Number	60731134	Operator	CJT
Facility	Henderson, KY	Source 1	OVEN C1, C2
Date		Source 2	

Method Performance Checks

Activity	Method	Criterion		Initials
Calibration Error (CE)	3A, 6C, 7E, 10	Gas within ±2.0% of calibration span (or ±0.5% for O_2 or CO_2)	Span gas	CT
			Mid-range gas	CT
			Zero gas	CT
	25A	Gas within 5% of certified value	Low-range gas	—
			Mid-range gas	—
			Span gas	—
System Bias Check	3A, 6C, 7E, 10	Gas thru system agrees with CE value within ±5.0% of cal span (±0.5% for O_2 or CO_2)	Upscale Gas	—
			Zero gas	—

Activity	Method	Criterion		Initials
Sample Flow Rate	3A, 6C, 7E, 10	Sample flow rate within 10% of flow rate from response time check and bias check		CT
Post-Test Calibration Drift Check	3A, 6C, 7E, 10	Gas reading within ±3.0% of calibration span of pre-test reading (±0.5% for O_2 or CO_2)	Upscale gas	CT
			Zero Gas	CT
	25A	Selected gas reading within ±3% of span of pre-test reading	Upscale gas	—
			Zero Gas	—
Hourly Calibration Drift Check	25A	Selected gas reading within ±3% of span of pre-test reading	Upscale gas	—
			Zero Gas	—

	Time	Activity	Analyzer Response						Sample Flow Rate
			O2	CO2	—	—	—	—	
	~~1135~~	Turn on Analyzers [1]	--	--	--	--	--	--	--
	1135	Cal Error Zero (N_2)	0.00	0.02					
	1138	Cal Error SPAN (O_2-CO_2)	22.11	20.39					
	1141	*~~OVEN~~ IN MID (O_2-CO_2)	10.01	10.16					
3-27-25	1143	OVEN INLET R1 C1	20.88	0.13					
	1146	OVEN OUTLET R1 C1	20.77	0.16					
	1237	OVEN INLET R2 C1	20.74	0.13					
	1240	OVEN OUTLET R2 C1	20.75	0.13					
	1336	OVEN INLET R3 C1	20.75	0.11					
	1339	OVEN OUTLET R3 C1	20.74	0.11					
	920	Cal Error Zero (N_2)	0.01	0.01					
	925	Cal Error SPAN (O_2-CO_2)	22.24	20.36					
	928	Cal Error Mid (O_2-CO_2)	10.02	10.09					
3-28-25	1054	Oven Inlet R1 C2	20.75	0.14					
	1057	Oven Outlet R1 C2	20.76	0.13					
	1155	OVEN Inlet R2 C2	20.78	0.15					
	1158	OVEN Outlet R2 C2	20.78	0.15					
	1225	Oven Inlet R3 C2	20.81	0.15					
	1228	Oven Outlet R3 C2	20.79	0.14					

[1] Turn On Analyzers" is to document sufficient warm-up time. If applicable, "yesterday" is an acceptable entry.

Comments * CT 3-27-25

Attachment C

Equipment Calibrations

Environmental Supply Company, Inc.

Quality Source Sampling Systems & Accessories

DRY GAS METER CALIBRATION REPORT

Customer: Aecom

Date: April 26, 2024

Console Serial # 80392

Console Model # Nutech 2010

DGM Model # S-275

DGM SN # 9366876

Reference Meter S/N 16300942

Barometric Pressure, P_b: 30.00 in. Hg

Tested at: 0 in. Hg - Vacuum

Standard Pressure : 29.92 in. Hg

Standard Temperature : 528 °R

	1	2	3	Units
Orifice Manometer Setting, ΔH	2.00	0.75	6.00	in. H_2O
Elapsed Time	14	22	8	min.
Reference Meter				
Final Volume Reading	611.270	621.958	633.162	ft^3
Initial Volume Reading	600.469	611.540	622.452	ft^3
Total Gas Volume, V_w	10.801	10.418	10.710	ft^3
Temperature, Initial	70.3	70.6	70.9	°F
Temperature, Final	70.6	70.8	70.8	°F
Avg Temperature, T_w	70.5	70.7	70.9	°F
Dry Gas Meter				
Final Volume Reading	558.340	569.359	580.655	ft^3
Initial Volume Reading	547.325	558.611	569.749	ft^3
Total Gas Volume, V_m	11.015	10.748	10.906	ft^3
Average Temperature, Initial	71.2	71.4	71.8	°F
Average Temperature, Final	71.7	71.7	72.2	°F
Avg Temperature, T_m	71.5	71.5	72.0	°F
ΔH (a)	1.8902	1.8830	1.8842	**Avg. ΔH(a) 1.8858**
ΔH (a) Tolerance Check	OK	OK	OK	
Gamma, Y	0.9776	0.9690	0.9698	**Avg. Y 0.9722**
Gamma Tolerance Check	OK	OK	OK	

Calibration Performed By:

$$\Delta H_{(a)} = \frac{0.0319\,\Delta H}{P_b\left(T_m + 460\right)}\left[\frac{\left(T_w + 460\right)\theta}{V_w}\right]^2$$

$$Y = \frac{V_w P_b\left(T_m + 460\right)}{V_m\left(P_b + \Delta H/13.6\right)\left(T_w + 460\right)}$$

5 Point Console Dry Gas Meter Calibration

Console ID	SC-M1540

		Initials	Date
Calibrated by		JMA	9/24/24
Reviewed by			
Console Sticker	Prepared		
	Reviewed		
	Affixed		
MCL-33 Prepared			

Console Calibration Expiration Date

24-Sep-2025

Orifice ID:	1388s-17		1388s-12		1388s-13		1388s-31		1388s-25	
Orifice K':	0.4657		0.3115		0.3418		0.8218		0.6908	
Dry Gas Meter	Run #1a	Run #1b	Run #2a	Run #2b	Run #3a	Run #3b	Run #4a	Run #4b	Run #5a	Run #5b
Initial Reading, (ft^3)	167.000	173.051	184.000	190.090	200.000	206.687	220.500	232.263	254.000	263.023
Final Reading, (ft^3)	173.051	179.115	190.090	196.188	206.687	213.408	232.263	244.038	263.023	272.029
Difference, (ft^3)	6.051	6.064	6.090	6.098	6.687	6.721	11.763	11.775	9.023	9.006
Initial Meter Temp., (°F)	74	75	77	77	78	78	79	79	80	79
Final Meter Temp., (°F)	75	76	77	78	78	79	79	79	79	79
Average Meter Temp., (°F)	74.5	75.5	77.0	77.5	78.0	78.5	79.0	79.0	79.5	79.0
Test Time (min.)	10	10	15	15	15	15	11	11	10	10
Orifice Manometer Reading, ("H_2O)	1.15	1.15	0.49	0.49	0.60	0.60	3.65	3.65	2.55	2.55
Barometric Pressure, ("Hg)	29.60		29.60		29.60		29.60		29.60	
Ambient Temperature, (°F)	74		75		75		75		75	
Pump Vacuum, ("Hg)	20	20	21	21	21	21	16	16	17	17
Standard Volume of the Meter, (V_{mstd})	5.928	5.930	5.929	5.931	6.500	6.527	11.498	11.510	8.788	8.780
Standard Volume of Critical Orifice, (V_{crstd})	5.965	5.965	5.979	5.979	6.561	6.561	11.568	11.568	8.840	8.840
Flow Rate (cfm)	0.593	0.593	0.395	0.395	0.433	0.435	1.045	1.046	0.879	0.878
DGM Calibration Factor, (Y)	1.006	1.006	1.009	1.008	1.009	1.005	1.006	1.005	1.006	1.007
Average DGM Calibration Factor (Y)	1.006		1.008		1.007		1.006		1.006	
Delta H@, ("H_2O)	1.787	1.783	1.691	1.690	1.718	1.716	1.832	1.832	1.800	1.801
Average ΔH@, ("H_2O)	1.785		1.690		1.717		1.832		1.800	

Current Average Y	1.007
All Individual Y within 2% of mean?	TRUE
Average Delta $H_@$	1.765
All individual $\Delta H_@$ within 0.20"H_2O of mean	TRUE

CDS-04S *DGM 5 point against orifice*

Per *EM SOP-002*

Issued: *September 2022*

Document reviewed biennially

Temperature Readout Calibration
Isokinetic Sampling Consoles

Calibrated by	Initials JMA	
	Date 9/24/24	
Reviewed by	Initials	
	Date	

Readout ID Number	**SC-M1540**

Reference Thermometer	ID Number	**SN: 240339657**
	Calibration Exp Date	**4/24/26**
Reference Thermocouple	ID Number	**WNW0107130**
	Calibration Exp Date	**10/18/24**
Voltage Generator	ID Number	**CL3512A (SN: 22000636)**
	Calibration Exp Date	**9/14/24**

Temperature Readout Calibration	
Reference Thermometer (°F)	**74.5**
Temperature Readout (°F)	**76**
Was readout adjusted? N	**Y/N**
Do these agree within 2°F Y	**Y**

Temperature Readout Linearity Check

Channel	**Voltage (mV)**	**Temperature (°F)**		
		Theoretical	**Observed**	**Difference** [1]
1	-0.0	32	34.5	2.5
	-1.0	-10	-7	3
	0.0	32	34.8	2.8
	1.0	77	79.6	2.6
	3.0	165	167.5	2.5
	5.0	251	253.5	2.5
	7.0	341	342.5	1.5
	10.0	475	476.5	1.5
	15.0	692	695	3
	20.0	905	908	3
	30.0	1329	1332	3
	40.0	1772	1775	3

Channel	**Voltage (mV)**	**Temperature (°F)**		
		Theoretical	**Observed**	**Difference** [1]
2	0.0	32	34.5	2.5
	5.0	251	252.5	1.5
3	0.0	32	34.5	2.5
	5.0	251	253	2
4	0.0	32	34.5	2.5
	1.0	77	79.5	2.5
5	0.0	32	34.5	2.5
	1.0	77	79.5	2.5
6	0.0	32		
	2.0	121		
7	0.0	32		
	2.0	121		

[1] Difference is calculated as follows: **Difference = $\text{Temp}_{\text{Observed}}$ - $\text{Temp}_{\text{Theoretical}}$**	*Acceptable difference is ±5 °F for temperatures below 1000 °F and ±10 °F for temperatures above 1000 °F*	*Are these met?* **Y**

S-Type Pitot Tube Inspection

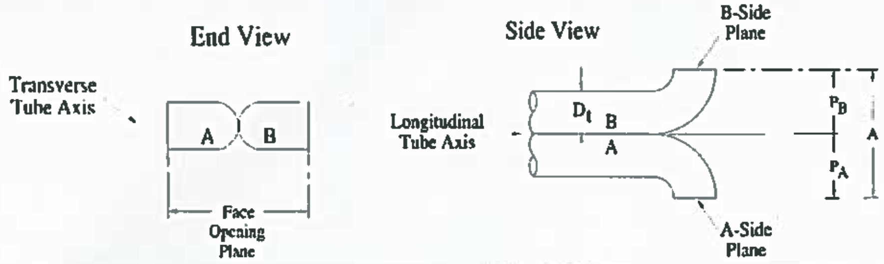
Probe ID	IP-M0405

Calibrated by	Initials	AW
	Date	5/3/21
Reviewed by	Initials	CJ
	Date	5/3/21

Caliper	ID	CAL-M1503
	Calibration Exp Date	3/19/2021

Angle Finder	ID	Digi-Pas
	Calibration Exp Date	N/A

General Pitot Tube Alignment



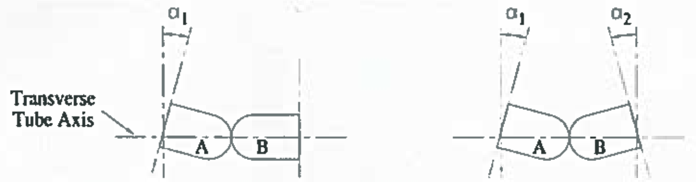
A = 0.95 "

D_t = 0.375

0.188" ≤ D_t ≤ 0.375"? Y (y/n)

1.05 ≤ $A/2D_t$ ≤ 1.50? Y (y/n)

Misalignment

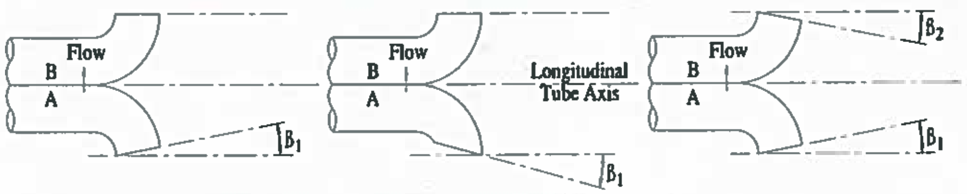


α_1 = 1.8 °

α_2 = 1.2 °

α_1≤10°? Y (y/n)

α_2≤10°? Y (y/n)

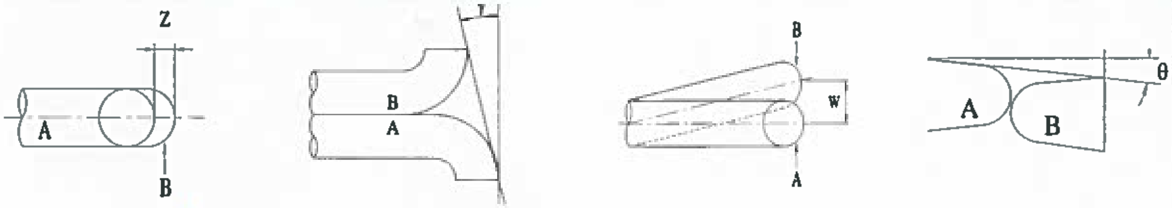


β_1 = 1.0

β_2 = 1.2

β_1≤5°? Y (y/n)

β_2≤5°? Y (y/n)



γ = 0.4 °

θ = 0.9 °

Z = A tan(γ) = 0.015

W = A tan(θ) = 0.015

Z ≤ 0.125"? Y (y/n)

W ≤ 0.031"? Y (y/n)

Acceptability for Use (Circle Selection)	If all answers are "Y", this pitot tube is available for use, and may be assigned a correction factor of 0.84	If all answers except the first (D_t) are "Y", this pitot tube is available for use, but needs to be calibrated using a wind tunnel.	Any other situation, the pitot tube must be removed from service.

Stack Thermocouple Calibration

Thermometer (or Readout/TC)	ID	210244580
	Calibration Exp Date	3/26/23
Temperature Readout	ID	SCM1550
	Calibration Exp Date	10/4/2028

Calibrated by	Initials	AW
	Date	5/3/21
Reviewed by	Initials	CJ
	Date	5/3/21

Reference Thermometer	Thermocouple Readout	Compare Readings	Function Check
T_F 77 °F $T_{abs,RT}$ 537 °R [1]	T_F 75 °F $T_{abs,TC}$ 535 °R	$\frac{T_{abs,TC}}{T_{abs,RT}}$ = 0.99 Between 0.985 and 1.015? Y / N	3°F change in readout upon external temperature stimulus? [✓ Y] / N

---

[1] T_{abs} (°R) = T_F (°F) + 460

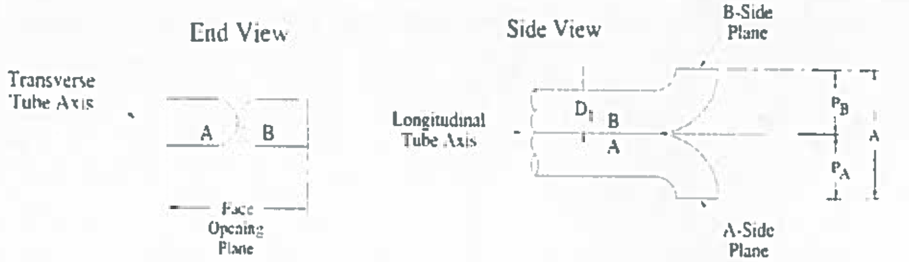
CDS-15F: Pitot Tube Inspection, TC Calibration
Per: EM SOP-009
Revised: September 2019
Document reviewed biennially

S-Type Pitot Tube Inspection

Probe ID	IP-M0609
Caliper ID	CAL-M1502
Caliper Calibration Expiration Date	3/15/25
Angle Finder ID	
Angle Finder Expiration Date	

Calibrated by	Initials	JMA
	Date	9/26/24
Reviewed by	Initials	JY
	Date	9/27/24

General Pitot Tube Alignment



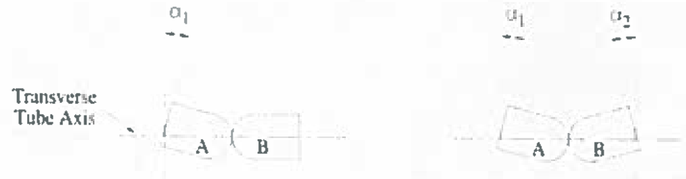
A = .935"

D_t = .374"

0.188"≤D_t ≤0.375"? Y (y/n)

$1.05 \leq A/2D_t \leq 1.50$? Y (y/n)

Misalignment

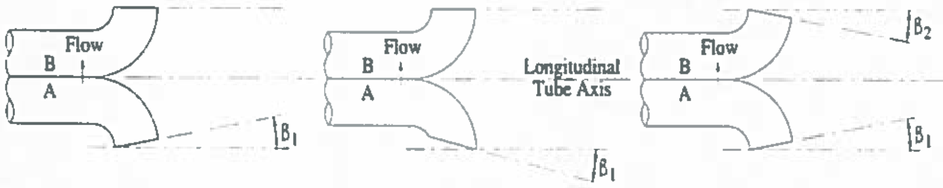


α_1 = .6 °

α_2 = .2 °

$\alpha_1 \leq 10°$? Y (y/n)

$\alpha_2 \leq 10°$? Y (y/n)

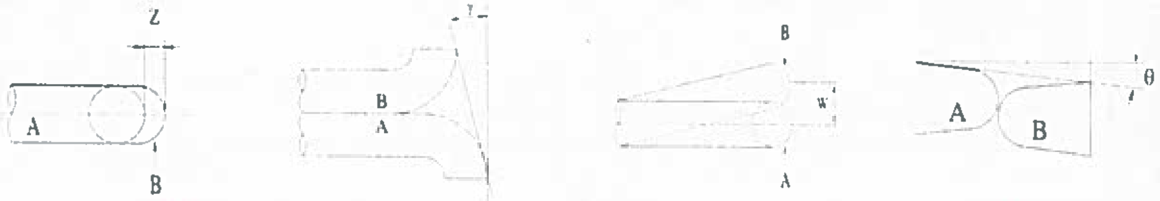


β_1 = .2 °

β_2 = .3 °

$\beta_1 \leq 5°$? Y (y/n)

$\beta_2 \leq 5°$? Y (y/n)



γ = .8 °

θ = 1.4 °

Z = A tan(γ) = .013

W = A tan(θ) = .022

Z ≤ 0.125"? Y (y/n)

W ≤ 0.031"? Y (y/n)

Acceptability for Use (Circle Selection)			
	[✓ If all answers are "Y", this pitot tube is available for use, and may be assigned a correction factor of 0.84]	If all answers except the first (D_t) are "Y", this pitot tube is available for use, but needs to be calibrated using a wind tunnel.	Any other situation, the pitot tube must be removed from service.

CDS-15: Pitot Tube Inspection
Per: EM SOP-009
Revised: September 2023
Document reviewed biennially

Airgas Specialty Gases
Airgas USA LLC
630 United Drive
Durham, NC 27713
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Part Number:	E03NI80E15A0138	Reference Number:	122-403155542-1
Cylinder Number:	CC464885	Cylinder Volume:	141.0 CF
Laboratory:	124 - Durham (SAP) - NC	Cylinder Pressure:	2015 PSIG
PGVP Number:	B22024	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Sep 30, 2024

Expiration Date: Sep 30, 2032

Certification performed in accordance with “EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)” document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	10.00 %	10.15 %	G1	+/- 0.6% NIST Traceable	09/30/2024
OXYGEN	10.00 %	10.01 %	G1	+/- 0.4% NIST Traceable	09/30/2024
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	19060402	6162642Y	11.105 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	Dec 04, 2025
NTRM	100106	K021587	9.967 % OXYGEN/NITROGEN	+/- 0.3%	Mar 22, 2028

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1P3228	Nondispersive Infrared (NDIR)	Sep 04, 2024
Siemens Oxymat 61 M3299 O2	Paramagnetic	Sep 04, 2024

Triad Data Available Upon Request

Signature on file

Approved for Release

Airgas Specialty Gases
Airgas USA LLC
630 United Drive
Durham, NC 27713
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Part Number:	E03NI58E15A25H0	Reference Number:	122-403042134-1
Cylinder Number:	XC006567B	Cylinder Volume:	160.0 CF
Laboratory:	124 - Durham (SAP) - NC	Cylinder Pressure:	2015 PSIG
PGVP Number:	B22024	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	May 13, 2024

Expiration Date: **May 13, 2032**

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	20.00 %	20.35 %	G1	+/- 0.7% NIST Traceable	05/13/2024
OXYGEN	22.00 %	22.10 %	G1	+/- 0.5% NIST Traceable	05/13/2024
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12061508	CC354696	19.87 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	Sep 01, 2029
NTRM	10010928	K021508	20.89 % OXYGEN/NITROGEN	+/- 0.5%	Mar 22, 2028

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1P3228	Nondispersive Infrared (NDIR)	Apr 17, 2024
Siemens Oxymat 61 M3299 O2	Paramagnetic	Apr 17, 2024

Triad Data Available Upon Request

Signature on file

Approved for Release

Attachment D

Quality Assurance and Quality Control

Calculation Summary

Console Calibration Check

Console Identification	SC-M1533	SC-M1533	SC-M1533
Date	3/27/2025	3/27/2025	3/27/2025
Project Name	Shamrock HF Study		
Test Duration (minutes) (Θ)	48	48	48
Meter Volume (dcf) (Vm)	27.09	27.97	28.77
Oxygen Content (%) (%O2)	20.77	20.75	20.74
Carbon Dioxide Content (%) (%CO2)	0.16	0.13	0.11
Nitrogen Content (%) (%N2)	79.07	79.12	79.15
Average DGM Temp (°F) (Tm)	51.4166667	55.4166667	56.8333333
Orifice Factor ("wc) (ΔH@)	1.886	1.886	1.886
Barometric Pressure ("Hg) (Pbar)	29.78	29.80	29.80
Average Delta H ("wc) (ΔHavg)	1.02	1.07	1.15
Average square root of ΔH ($(\surd\Delta H)_{avg}$)	1.01	1.03	1.07
Gas Molecular Weight (Dry) (M_d) (g/g-mole)	28.9	28.9	28.8
DGMCF (Yd)	0.972	0.972	0.972
Dry Gas Meter Calibration Check Value (Y_{QA})	0.96	0.96	0.97
Deviation Y_{QA} to Y_d (%)	-0.79	-1.11	-0.22

Calculation Summary

Console Calibration Check

Console Identification	SC-M1540	SC-M1540	SC-M1540
Date	3/27/2025	3/27/2025	3/27/2025
Project Name	Shamrock HF Study		
Test Duration (minutes) (Θ)	48	48	48
Meter Volume (dcf) (Vm)	31.36	36.50	42.84
Oxygen Content (%) (%O2)	20.88	20.74	20.75
Carbon Dioxide Content (%) (%CO2)	0.13	0.13	0.11
Nitrogen Content (%) (%N2)	78.99	79.13	79.14
Average DGM Temp (°F) (Tm)	55.33333333	59.83333333	61.08333333
Orifice Factor ("wc) (ΔH@)	1.765	1.765	1.765
Barometric Pressure ("Hg) (Pbar)	29.78	29.78	29.78
Average Delta H ("wc) (ΔHavg)	1.64	2.15	2.93
Average square root of ΔH ($(\sqrt{\Delta H})_{avg}$)	1.27	1.46	1.71
Gas Molecular Weight (Dry) (M_d) (g/g-mole)	28.9	28.9	28.8
DGMCF (Yd)	1.007	1.007	1.007
Dry Gas Meter Calibration Check Value (Y_{QA})	1.084	1.077	1.075
Deviation Y_{QA} to Y_d (%)	7.67	6.93	6.79

Note: Per EPA Method 5, the intial Yd factor gives worst case scenerio emissions and will be used for all calculations

Barometric Pressure at the Sampling Location

Corrected per EPA Method 2, Section 6.5

$$P_{bar} = P_{bar,meas} - \left(Elev \times \frac{0.1}{100}\right)$$

$P_{bar,meas}$ = Barometric pressure as measured	=	29.78	in. Hg
Elev = elevation of sampling location relative to barometer	=	0	feet
P_{bar} = Barometric pressure at the sampling site	=	29.78	in. Hg

$$P_{bar} = 29.78 - \left(\frac{0 \ \text{X} \ 0.1}{100}\right)$$

P_{bar} = 29.78

Absolute Stack Pressure at the Sampling Location

CAs Defined in EPA Method 2, Section 12.1

$$P_S = P_{bar} + \left(\frac{P_g}{13.6}\right)$$

P_{bar} = Barometric pressure at the sampling site	=	29.78	in. Hg
P_g = Stack Static Pressure	=	-6.5	in. Water
P_s = Absolute Stack Pressure	=	29.30	in. Hg

$$P_s = 29.78 + \left(\frac{-6.5}{13.6}\right)$$

P_s = 29.30

Volume of Water Vapor Condensed

corrected to standard conditions, ft^3 - as per US EPA Method 5, Eq. 5-2

Adapted for the measurement of mass of water as opposed to the volume of water.

$$V_{w(std)} = \frac{V_{1c} \times K \times R \times T_{std}}{M_w \times P_{std}}$$

V_{1c} = Total weight of liquid collected	=	7.5	g
K=conversion of grams to pounds	=	0.0022046	lb/g
R = Ideal Gas Constant	=	21.85	inHg - ft^3/degR - lbmole
T_{std} = Standard absolute temperature	=	527.67	degR
M_w = Molecular Weight of Water	=	18.015	lb/lbmole
P_{std} = Standard absolute pressure	=	29.92	inHg

$$V_{w(std)} = \frac{7.5 \times 0.0022 \times 21.85 \times 527.67}{18.015 \times 29.92}$$

$V_{w(std)}$ = 0.3536788

Moisture Content, proportion, by volume

as per US EPA Method 5, Eq. 5-3

$$B_{ws} = \frac{V_{w(std)}}{V_{m(std)} \times V_{w(std)}}$$

$V_{w(std)}$ = Volume of water vapor condensed = $\boxed{0.354}$ ft^3

$V_{m(std)}$ = Dry Gas Volume = $\boxed{32.340}$ ft^3

$$\mathbf{B}_{ws} = \frac{0.354}{32.340 + 0.354}$$

$$\mathbf{B}_{ws} = 0.0108$$

Moisture content at saturation

$\mathbf{B}_{ws}$ = 0.03315

This calculated by polynomial fit:

$(86.7222826792858 + T_{s*}(-0.645483277572566) + T_s^{2}*0.00181527101645074 + T_s^{3} * (-2.28823297043421E-06) + (T_s)^{4}*1.09201445204276E-09)*100*29.92/P_s)$

86.722282679285800			=	86.7
-0.645483277572566	X	537.9	=	-347.2
0.00181527101645074	X	289358	=	525.3
-2.28823297043421E-06	X	2E+08	=	-356.2
1.09201445204276E-09	X	8E+10	=	91.4
		sum	=	0.0325

$$\text{sum} \times 100 \times \frac{29.92}{29.30} = 3.32$$

for further calculations

$\mathbf{B}_{ws}$ = 0.0108

Dry Molecular Weight of Stack Gas, lb/lb-mole

as per US EPA Method 3, Eq. 3-1

$$M_d = MW_{CO}(\%CO) + MW_{CO2}(\%CO_2) + MW_{O2}(\%O_2) + MW_{H2}(\%H_2) + MW_{CH4}(\%CH_4) + MW_{N2}(\%N_2)$$

MW_{CO}= Molecular weight of CO, divided by 100 = 0.28 lb/lb-mole

%CO = Percent CO by volume, dry basis = 0.0 %

MW_{CO2}= Molecular weight of CO_2, divided by 100 = 0.44 lb/lb-mole

$\%CO_2$ = Percent CO_2 by volume, dry basis = 0.1 %

MW_{O2} = Molecular weight of O_2, divided by 100 = 0.32 lb/lb-mole

$\%O_2$ = Percent O_2 by volume, dry basis = 20.9 %

MW_{H2} = Molecular weight of H_2, divided by 100 = 0.02 lb/lb-mole

$\%H_2$ = Percent H_2 by volume, dry basis = 0.0 %

MW_{CH4} = Molecular weight of CH_4, divided by 100 = 0.16 lb/lb-mole

$\%CH_4$ = Percent CH_4 by volume, dry basis = 0.0 %

MW_{N2} = Molecular weight of N_2, divided by 100 = 0.28 lb/lb-mole

$\%N_2$ = 100% - %CO - $\%CO_2$ - $\%O_2$ - %H2 - %CH4 = 79.0 %

$$M_d = (0.28 \times 0.0) + (0.44 \times 0.1) + (0.32 \times 20.9) + (0.02 \times 0.0) + (0.16 \times 0.0) + (0.28 \times 79.0)$$

M_d = 28.86 lb/lb-mole

Molecular Weight of stack gas, lb/lb-mole

as per US EPA Method 2, Eq. 2-6

$$M_S = M_d\,(1 - B_{ws}) + (18.0 \times B_{ws})$$

M_d= Dry molecular weight of stack gas = 28.86 lb/lb-mole

B_{ws}= Proportion of water vapor, by volume = 0.011 proportion

18.0 = Molecular Weight of H_2O = 18.00 lb/lb-mole

M_s = 28.86 (1 - 0.011) + (18.00 X 0.011)

M_s = 28.74

Dry Gas Volume, corrected to actual conditions, ft^3

$$V_{m(actual)} = V_m \times Y$$

V_m = Volume of gas sample, dry = 31.364 ft^3

Y = Dry gas meter calibration factor = 1.007

$$\mathbf{V_{m(actual)}} = 31.364 \ \text{X} \ 1.007$$

$$\mathbf{V_{m(actual)}} = 31.584$$

Dry Gas Volume, corrected to standard conditions, ft^3

as per US EPA Method 5, Eq. 5-1

$$V_{m(std)} = V_m \times Y \times \frac{T_{std} \times \left(P_{bar} + \left(\frac{\Delta H}{13.6}\right)\right)}{T_m \times P_{std}}$$

V_m = Volume of gas sample, dry = 31.364 ft^3

Y = Dry gas meter calibration factor = 1.007

Tstd = Standard Temperature = 528 °R

P_{bar} = Barometric pressure at the sampling site = 29.78 in. Hg

deltaH = Average pressure differential across the orifice meter = 1.64 in. H_2O

13.6 = Conversion factor = 13.6 in. H_2O/in. Hg

Tm = Absolute average DGM temperature = 515.00 °R

$$\mathbf{V_{m(std)}} = 31.364 \ \text{X} \ 1.007 \ \text{X} \ \frac{527.7 \ \text{X} \ \left(29.78 + \frac{1.64}{13.6} \right)}{515.0 \ \text{X} \ 29.92}$$

$$\mathbf{V_{m(std)}} = 32.340$$

Average Stack Gas Velocity, ft/sec

as per US EPA Method 2, Eq. 2-7

$$v_S = K_p \times C_p \times \Delta P_{avg} \times \sqrt{\frac{T_S}{P_S \times M_S}}$$

K_p= Velocity equation constant	=	85.49	ft/sec[((lb/lb-mole)(in.Hg))/((degR)(in.H2O))]^{½}
C_p = S type pitot tube coefficient	=	0.84	
deltaP$_{avg}$=ave. sqrt. of the velocity head of stack gas	=	0.39	in.H_2O
T_s = Absolute stack temperature	=	537.9	degR
P_s = Absolute stack pressure	=	29.30	in. Hg
M_s = Molecular Weight of stack gas	=	28.74	lb/lb-mole

$$\mathbf{v_s} = 85.49 \quad X \quad 0.84 \quad X \quad 0.39 \quad X \left(\frac{537.9}{29.30 \quad X \quad 28.74} \right)^{0.5}$$

v_s = 22.45 ft/sec

Average Stack Gas Volumetric Flow Rate - Actual Conditions

$$Q_{actual} = v_S \times A$$

v_s = Average stack gas velocity	=	22.45	ft/sec
A = Cross sectional area of stack	=	1.58	ft^2

Q_{actual} = 22.45 X 1.58

Q_{actual} = 35 cubic feet per second

Q_{actual} = 2,123 cubic feet per minute

Q_{actual} = 127,388 cubic feet per hour

Average Stack Gas Dry Volumetric Flow Rate, dscf/hr

as per US EPA Method 2, Eq. 2-8

$$Q = \frac{3600 \times (1 - B_{ws}) \times v_s \times A \times T_{std} \times P_s}{T_s \times P_{std}}$$

3600 = Conversion factor	=	3600	sec/hr
B_{ws} = Proportion of water vapor, by volume	=	0.011	proportion
v_s = Average stack gas velocity	=	22.45	ft/sec
A = Cross sectional area of stack	=	1.58	ft^2
T_{std} = Standard absolute temperature	=	528	degR
P_s = Absolute stack pressure	=	29.30	in. Hg
T_s = Absolute stack temperature	=	537.9	degR
P_{std} = Standard absolute pressure	=	29.92	in. Hg

$$\mathbf{Q_s} = \frac{3600 \ \mathrm{X} \ (1 - 0.011) \ \mathrm{X} \ 22.45 \ \mathrm{X} \ 1.576 \ \mathrm{x} \ 528 \ \mathrm{x} \ 29.30}{537.9 \ \mathrm{X} \ 29.92}$$

$\mathbf{Q_s}$ = 121,056 dscf/hr

$\mathbf{Q_s}$ = 2,018 dscf/min

Average Stack Gas Wet Volumetric Flow Rate, wscf/hr

$$Q_W = \frac{Q}{(1 - B_{ws})}$$

Q = Average Stack Gas Dry Volumetric Flow Rate	=	121,056	dscf/hr
B_{ws} = Proportion of water vapor, by volume	=	0.011	proportion

$$\mathbf{Q_w} = \frac{121{,}056}{(1 - 0.011)}$$

$\mathbf{Q_w}$ = 122,380 wscf/hr

$\mathbf{Q_w}$ = 2,040 wscf/min

Isokinetic Variation, %

as per US EPA Method 5, Eq. 5-8

$$I= \frac{100 \times T_s \times V_{m(std)} \times P_{std}}{60 \times T_{std} \times P_s \times v_s \times A_n \times \theta \times (1 - B_{ws})}$$

100 = Conversion to Percent	=	100	
T_s = Absolute stack temperature	=	538	degR
$V_{m(std)}$ = Dry Gas Volume	=	32.340	ft^3
P_{std} = Standard absolute pressure	=	29.920	in. Hg
60 = Sec/Min	=	60	Sec/Min
T_{std} = Standard absolute temperature	=	528	degR
P_s = Absolute stack pressure	=	29.30	in. Hg
v_s = Average stack gas velocity	=	22.45	ft/sec
A_n = Cross-sectional Area of nozzle	=	0.0005378	ft^2
θ = Total sampling time	=	48	minutes
B_{ws} = Proportion of water vapor, by volume	=	0.011	proportion

$$I = \frac{100 \text{ X } 537.9 \text{ X } 32.340 \text{ X } 29.92}{60 \text{ X } 528 \text{ X } 29.30 \text{ X } 22.45 \text{ X } 0.0005378 \text{ X } 48 \text{ X } (1 - 0.011)}$$

$I = 97.88$

Field Dry Gas Meter Calibration Check. Calculation of Y_{QA}

$$Y_{QA} = \frac{\theta}{V_m}\sqrt{\frac{0.0319\ T_m}{\Delta H@\left(P_{bar} + \frac{\Delta H_{avg}}{13.6}\right)}\left(\frac{29}{M_d}\right)}\left(\sqrt{\Delta H}\right)_{avg}$$

θ = Total sampling time = 48

V_m = Volume of gas sample, dry = 31.364 ft^3

0.0319 = Conversion Factors = 0.0319 (in Hg/°R) cfm^2

T_m = Absolute average DGM temperature = 515.0 °R

$\Delta H@$ = Orifice meter calibration coefficient = 1.765 in H_2O

P_{bar} = Barometric pressure at the sampling site = 29.78 in. Hg

ΔH = Average pressure differential across the orifice meter = 1.644 in. H_2O

29 = molecular weight of air = 29.00 lb/lb-mole

M_d = Dry Molecular Weight of Stack Gas = 28.86 lb/lb-mole

$(\sqrt{\Delta H})_{avg}$ = Average square root of ΔH = 1.267

$$Y_{QA} = \frac{48.0}{31.364} \times \left(\frac{0.0319 \times 515.0 \times 29}{1.765 \times \left(29.78 + \frac{1.644}{13.60}\right) \times 28.856}\right)^{0.5} \times 1.267$$

Y_{QA} = 1.084

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007AI

Administrative Information

___ Section AI.1: Source Information
___ Section AI.2: Applicant Information
___ Section AI.3: Owner Information
___ Section AI.4: Type of Application
___ Section AI.5: Other Required Information
___ Section AI.6: Signature Block
___ Section AI.7: Notes, Comments, and Explanations

Additional Documentation

___ Additional Documentation attached

Source Name: **Shamrock Technologies, Inc.**
KY EIS (AFS) #: **21- 101-00136**
Permit #: **F-16-012 R1**
Agency Interest (AI) ID: **46709**
Date: **Feb-26**

Section AI.1: Source Information

Physical Location Address:	**Street:**	301 Community Drive				
	City:	Henderson	**County:**	Henderson	**Zip Code:**	42420
Mailing Address:	**Street or P.O. Box:**	301 Community Drive				
	City:	Henderson	**State:**	KY	**Zip Code:**	42420

Standard Coordinates for Source Physical Location

Longitude: -87.641262 (decimal degrees) **Latitude:** 37.805884 (decimal degrees)

Primary (NAICS) Category: All other Misc Plastics Products Manufacturing **Primary NAICS #:** 326199

Classification (SIC) Category: Chemicals and Chemical Preparations NEC **Primary SIC #:** 2899

Briefly discuss the type of business conducted at this site: Shamrock recycles polytetrafluorethylene (PTFE) by irradiating the ground material and baking irradiated material to process into fresh micropowders for different applications within inks and coatings, etc.

Description of Area Surrounding Source: ☐ Rural Area ☑ Industrial Park ☐ Residential Area ☐ Urban Area ☐ Industrial Area ☐ Commercial Area

Is any part of the source located on federal land? ☐ Yes ☑ No

Number of Employees: 92 (approx)

Approximate distance to nearest residence or commercial property: *700 ft (approx)*

Property Area: **11 acres (approx)**

Is this source portable? ☐ Yes ☑ No

What other environmental permits or registrations does this source currently hold or need to obtain in Kentucky?

NPDES/KPDES: ☑ Currently Hold ☐ Need ☐ N/A

Solid Waste: ☐ Currently Hold ☐ Need ☑ N/A

RCRA: ☑ Currently Hold ☐ Need ☐ N/A

UST: ☐ Currently Hold ☐ Need ☑ N/A

Type of Regulated Waste Activity:
☐ Mixed Waste Generator ☑ Generator ☐ Recycler ☐ Other: ______________
☐ U.S. Importer of Hazardous Waste ☐ Transporter ☐ Treatment/Storage/Disposal Facility ☐ N/A

Section AI.2: Applicant Information

Applicant Name: Shamrock Technologies, Inc.

Title: (if individual)

Mailing Address:
Street or P.O. Box: 301 Community Dr.
City: Henderson **State:** KY **Zip Code:** 42420

Email: (if individual)

Phone: (270) 826-7006

Technical Contact

Name: Michael Chesnut

Title: Process Engineer

Mailing Address:
Street or P.O. Box: 301 Community Dr
City: Henderson **State:** KY **Zip Code:** 42420

Email: MChesnut@shamrocktechnologies.com

Phone: (270) 826-7006

Air Permit Contact for Source

Name: Michael Jussila

Title: Environmental Leader

Mailing Address:
Street or P.O. Box: 301 Community Dr
City: Henderson **State:** KY **Zip Code:** 42420

Email: mjussila@shamrocktechnologies.com

Phone: (270) 826-7006

Section AI.3: Owner Information

☑ **Owner same as applicant**

Name: Shamrock Technologies, Inc.

Title:

Mailing Address:
Street or P.O. Box: Foot of Pacific Street
City: Newark **State:** NJ **Zip Code:** 07114

Email: bneuberg@shamrocktechnologies.com

Phone: (973)286-4889

List names of owners and officers of the company who have an interest in the company of 5% or more.

Name	Position
William Neuberg	Owner

Section AI.4: Type of Application

Current Status: ☐ Title V ☑ Conditional Major ☐ State-Origin ☐ General Permit ☐ Registration ☐ None

Requested Action: *(check all that apply)*

☐ Name Change	☐ Initial Registration	☐ Significant Revision	☐ Administrative Permit Amendment
☐ Renewal Permit	☐ Revised Registration	☑ Minor Revision	☐ Initial Source-wide OperatingPermit
☐ 502(b)(10)Change	☐ Extension Request	☐ Addition of New Facility	☐ Portable Plant Relocation Notice
☐ Revision	☐ Off Permit Change	☐ Landfill Alternate Compliance Submittal	☐ Modification of Existing Facilities
☐ Ownership Change	☐ Closure		

Requested Status: ☐ Title V ☑ Conditional Major ☐ State-Origin ☐ PSD ☐ NSR ☐ Other: ____________

Is the source requesting a limitation of potential emissions? ☐ Yes ☑ No

Pollutant:	**Requested Limit:**	**Pollutant:**	**Requested Limit:**
☐ Particulate Matter		☐ Single HAP	
☐ Volatile Organic Compounds (VOC)		☐ Combined HAPs	
☐ Carbon Monoxide		☐ Air Toxics (40 CFR 68, Subpart F)	
☐ Nitrogen Oxides		☐ Carbon Dioxide	
☐ Sulfur Dioxide		☐ Greenhouse Gases (GHG)	
☐ Lead		☐ Other	

For New Construction:

Proposed Start Date of Construction: *(MM/YYYY)* 09/2024

Proposed Operation Start-Up Date: *(MM/YYYY)* 03/2025

For Modifications:

Proposed Start Date of Modification: *(MM/YYYY)* ____________

Proposed Operation Start-Up Date: *(MM/YYYY)* ____________

Applicant is seeking coverage under a permit shield. ☐ **Yes** ☑ **No**

Identify any non-applicable requirements for which permit shield is sought on a separate attachment to the application.

Section AI.5 Other Required Information

Indicate the documents attached as part of this application:

☐ DEP7007A Indirect Heat Exchangers and Turbines
☑ DEP7007B Manufacturing or Processing Operations
☐ DEP7007C Incinerators and Waste Burners
☐ DEP7007F Episode Standby Plan
☐ DEP7007J Volatile Liquid Storage
☐ DEP7007K Surface Coating or Printing Operations
☐ DEP7007L Mineral Processes
☐ DEP7007M Metal Cleaning Degreasers
☑ DEP7007N Source Emissions Profile
☐ DEP7007P Perchloroethylene Dry Cleaning Systems
☐ DEP7007R Emission Offset Credit
☐ DEP7007S Service Stations
☐ DEP7007T Metal Plating and Surface Treatment Operations
☑ DEP7007V Applicable Requirements and Compliance Activities
☐ DEP7007Y Good Engineering Practice and Stack Height Determination
☐ DEP7007AA Compliance Schedule for Non-complying Emission Units
☐ DEP7007BB Certified Progress Report
☐ DEP7007CC Compliance Certification
☑ DEP7007DD Insignificant Activities
☐ DEP7007EE Internal Combustion Engines
☐ DEP7007FF Secondary Aluminum Processing
☑ DEP7007GG Control Equipment
☐ DEP7007HH Haul Roads
☐ Confidentiality Claim
☐ Ownership Change Form
☐ Secretary of State Certificate
☐ Flowcharts or diagrams depicting process
☐ Digital Line Graphs (DLG) files of buldings, roads, etc.
☐ Site Map
☐ Map or drawing depicting location of facility
☐ Safety Data Sheet (SDS)
☐ Emergency Response Plan
☐ Other: ____________________________

Section AI.6: Signature Block

I, the undersigned, hereby certify under penalty of law, that I am a responsible official*, and that I have personally examined, and am familiar with, the information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the information is on knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false or incomplete information, including the possibility of fine or imprisonment.

Signed by:
Robert L Kahle
70FB9F5220A34E0...

Authorized Signature

Feb 23, 2026 | 12:15 PST

Date

Rob Kahle

Type or Printed Name of Signatory

CFO

Title of Signatory

*Responsible official as defined by 401 KAR 52:001.

Section AI.7: Notes, Comments, and Explanations

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007B

Manufacturing or Processing Operations

___ Section B.1: Process Information
___ Section B.2: Materials and Fuel Information
___ Section B.3: Notes, Comments, and Explanations

Additional Documentation

___ Complete DEP7007AI, DEP7007N, DEP7007V, and DEP7007GG.
___ Attach a flow diagram
___ Attach SDS

Source Name: **Shamrock Technologies, Inc.**
KY EIS (AFS) #: **21- 101-00136**
Permit #: **F-16-012-R1**
Agency Interest (AI) ID: **46709**
Date: **Feb-26**

Section B.1: Process Information

Emission Unit #	Emission Unit Name	Describe Emission Unit	Process ID	Process Name	Manufacturer	Model No.	Proposed/Actual Date of Construction Commencement *(MM/YYYY)*	Is the Process <u>Continuous</u> or <u>Batch</u>?	Number of Batches per 24 Hours *(if applicable)*	Hours per Batch *(if applicable)*
E1	Blender	Solids Blender	1	Solids Blender	Not available	Not available	09/2024	Batch	9.60	2.5

Section B.2: Materials and Fuel Information

**Maximum yearly fuel usage rate only applies if applicant request operating restrictions through federally enforceable limitations.*

Emission Unit #	**Emission Unit Name**	**Name of Raw Materials Input**	**Maximum Quantity of Each Raw Material Input**		**Total Process Weight Rate for Emission Unit** *(tons/hr)*	**Name of Finished Materials**	**Maximum Quantity of Each Finished Material Output**		**Fuel Type**	**Maximum Hourly Fuel Usage Rate**		**Maximum Yearly Fuel Usage Rate**		**Sulfur Content** *(%)*	**Ash Content** *(%)*
				(Specify Units/hr)				*(Specify Units/hr)*			*(Specify Units)*		*(Specify Units)*		
E1	Blender	Solids Materials	3000	lb	1.5	Solids Blend	3000	lb	None	-	-		-	-	-

Section B.3: Notes, Comments, and Explanations

Division for Air Quality

300 Sower Boulevard
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DEP7007N

Source Emissions Profile

__ Section N.1: Emission Summary
__ Section N.2: Stack Information
__ Section N.3: Fugitive Information
__ Section N.4: Notes, Comments, and Explanations

Additional Documentation

___ Complete DEP7007AI

Source Name: Shamrock Technologies, Inc.
KY EIS (AFS) #: **21-** 101-00136
Permit #: F-16-012-R1
Agency Interest (AI) ID: 46709
Date: February-26

N.1: Emission Summary

Emission Unit #	Emission Unit Name	Process ID	Process Name	Control Device Name	Control Device ID	Stack ID	Maximum Design Capacity *(SCC Units/hour)*	Pollutant	Uncontrolled Emission Factor *(lb/SCC Units)*	Emission Factor Source (e.g. AP-42, Stack Test, Mass Balance)	Capture Efficiency *(%)*	Control Efficiency *(%)*	Hourly Emissions		Annual Emissions	
													Uncontrolled Potential *(lb/hr)*	Controlled Potential *(lb/hr)*	Uncontrolled Potential *(tons/yr)*	Controlled Potential *(tons/yr)*
E1	Blender	1	Solids Blender	Fabric Filter	F-1	F1	1.2 (1000-lb)	PM	5.8	AP-42	100%	99.5%	7.00	0.035	30.66	0.153

Section N.2: Stack Information

UTM Zone:

Stack ID	Identify all Emission Units (with Process ID) and Control Devices that Feed to Stack	Stack Physical Data			Stack UTM Coordinates		Stack Gas Stream Data		
		Equivalent Diameter *(ft)*	Height *(ft)*	Base Elevation *(ft)*	Northing *(m)*	Easting *(m)*	Flowrate *(acfm)*	Temperature *(° F)*	Exit Velocity *(ft/sec)*
F1	E1	0.5	60	385	4184484	443662	2700	68	229

Section N.3: Fugitive Information

UTM Zone:

Emission Unit #	Emission Unit Name	Process ID	Area Physical Data		Area UTM Coordinates		Area Release Data	
			Length of the X Side *(ft)*	Length of the Y Side *(ft)*	Northing *(m)*	Easting *(m)*	Release Temperature *(°F)*	Release Height *(ft)*
NA	NA	NA	NA	NA	NA	NA	NA	NA

Section N.4: Notes, Comments, and Explanations

Division for Air Quality

300 Sower Boulevard
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(502) 564-3999

DEP7007V

Applicable Requirements and Compliance Activities

___ Section V.1: Emission and Operating Limitation(s)
___ Section V.2: Monitoring Requirements
___ Section V.3: Recordkeeping Requirements
___ Section V.4: Reporting Requirements
___ Section V.5: Testing Requirements
___ Section V.6: Notes, Comments, and Explanations

Additional Documentation

___ Complete DEP7007AI

Source Name: **Shamrock Technologies, Inc.**
KY EIS (AFS) #: 21- **101-00136**
Permit #: **F-16-012-R1**
Agency Interest (AI) ID: **46709**
Date: **February-26**

Section V.1: Emission and Operating Limitation(s)

Emission Unit #	Emission Unit Description	Applicable Regulation or Requirement	Pollutant	Emission Limit (if applicable)	Voluntary Emission Limit or Exemption (if applicable)	Operating Requirement or Limitation (if applicable)	Method of Determining Compliance with the Emission and Operating Requirement(s)
E1	Blender	Section 3(2) of KAR 59:010	PM	2.62 lb/hr	None	None	Pollution control device inspection and maintenance
E1	Blender	Section 3(1) of KAR 59:010	Visible Emissoins	20% opacity	None	None	None

Section V.2: Monitoring Requirements

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Monitored	Description of Monitoring
E1	Blender	PM	Not appliable	None	None

Section V.3: Recordkeeping Requirements

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Recorded	Description of Recordkeeping
E1	Blender	PM	Not appliable	Baghouse, inspection, maintenance and repair summaries.	Dates, person conducting inspection and maintenance, description of repair if any.

Section V.4: Reporting Requirements

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Reported	Description of Reporting
E1	Blender	PM	Not appliable	None	None

Section V.5: Testing Requirements

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Tested	Description of Testing
E1	Blender	PM	Not applicable	Not applicable	Not applicable

Section V.6: Notes, Comments, and Explanations

Division for Air Quality
300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007DD

Insignificant Activities

___ Section DD.1: Table of Insignificant Activities
___ Section DD.2: Signature Block
___ Section DD.3: Notes, Comments, and Explanations

Source Name: **Shamrock Technologies, Inc.**

KY EIS (AFS) #: **21- 101-00144**

Permit #: **S-15-041 R1**

Agency Interest (AI) ID: **38464**

Date: **Feb-26**

Section DD.1: Table of Insignificant Activities

*Identify each activity with a unique Insignificant Activity number (IA #); for example: 1, 2, 3… etc.

Insignificant Activity #	Description of Activity including Rated Capacity	Serial Number or Other Unique Identifier	Applicable Regulation(s)	Calculated Emissions
32	3 Ceiling Heaters	-	401 KAR 59:010 401 KAR 63:020	PM: 0.016 tpy SO2: 0.0013 tpy VOC: 0.0118 tpy NOx: 0.2138 CO: 0.1796 tpy Total HAP: 0.004 tpy

Insignificant Activity #	Description of Activity including Rated Capacity	Serial Number or Other Unique Identifier	Applicable Regulation(s)	Calculated Emissions

Section DD.2: Signature Block

I, THE UNDERSIGNED, HEREBY CERTIFY UNDER PENALTY OF LAW, THAT I AM A RESPONSIBLE OFFICIAL, AND THAT I HAVE PERSONALLY EXAMINED, AND AM FAMILIAR WITH, THE INFORMATION SUBMITTED IN THIS DOCUMENT AND ALL ITS ATTACHMENTS. BASED ON MY INQUIRY OF THOSE INDIVIDUALS WITH PRIMARY RESPONSIBILITY FOR OBTAINING THE INFORMATION, I CERTIFY THAT THE INFORMATION IS ON KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE OR INCOMPLETE INFORMATION, INCLUDING THE POSSIBILITY OF FINE OR IMPRISONMENT.

By:

Signed by:
Robert L Kahle
76FB9F5226A34E0...
Authorized Signature

Feb 23, 2026 | 12:15 PST
Date

Rob Kahle
Type/Print Name of Siguatory

CFO
Title of Siguatory

Section DD.3: Notes, Comments, and Explanations

Division for Air Quality

300 Sower Boulevard

Frankfort, KY 40601

(502) 564-3999

DEP7007GG
Control Equipment

Additional Documentation

___ Complete Sections GG.1 through GG.12, as applicable

___ Attach manufacturer's specifications for each control device

___ Complete DEP7007AI

Source Name: Shamrock Technologies, Inc.

KY EIS (AFS) #: 21- 101-00136

Permit #: F-16-012-R1

Agency Interest (AI) ID: 46709

Date: February-26

Section GG.1: General Information - Control Equipment

Control Device ID #	Control Device Name	Cost	Manufacturer	Model Name/ Serial #	Date Installed	Inlet Gas Stream Data For <u>All</u> Control Devices					Inlet Gas Stream Data For Condensers, Adsorbers, Afterburners, Incinerators, Oxidizers <u>Only</u>			Equipment Operational Data For <u>All</u> Control Devices		
						Temperature *(°F)*	Flowrate *(scfm @ 68°F)*	Average Particle Diameter *(μm)*	Particle Density *(lb/ft^3)* or Specific Gravity	Gas Density *(lb/ft^3)*	Gas Moisture Content *(%)*	Gas Composition	Fan Type	Pressure Drop Range *(in. H_2O)*	Pollutants Collected/ Controlled	Pollutant Removal *(%)*
FF-1	Fabric Filter	-	Unknown	Unknown	Sep-24	70	800	-	-	-	0% - 0.5%	20% O2	Direct Drive	Unknown	PM	99.5

Section GG.6: Filter

Control Device ID #	**Identify all Emission Units and Control Devices that Feed to Filter**	**Identify Type of Filter Unit:** Baghouse, Cartridge Collector, or Other (specify)	**Identify Type of Filtering Material:** Fabric, Paper, Synthetic, or Other (specify)	**Total Filter Area** *(ft^2)*	**Effective Air-to-Filter Ratio** *($acfm/ft^2$)*	**Continuous Monitoring Instrumentation** (e.g. COMS, BLDS, none)	**Additional Materials Introduced into the Control System** (e.g. lime, carbon)		**Identify Cleaning Method:** Shaker, Pulse Air, Reverse Air, Pulse Jet, or Other (specify)	**Identify Gas Cooling Method:** Ductwork, Heat Exchanger, Bleed-in Air, Water Spray, or Other (specify)	**For Ductwork:**		**For Bleed-in Air:**	**For Water Spray:**
							Material	**Injection Rate** *(lb/hr)*			**Length** *(ft)*	**Diameter** *(ft)*	**Flowrate** *(scfm @ 68°F)*	**Flowrate** *(gal/min)*
FF-1	Product Bagging (EU8)	Baghouse	Polyester	160	5	None	None	-	Pulse Jet	None	-	-	-	-

Shamrock Technologies
301 Community Dr
Henderson, KY
Blending Operations PTE

Process Description:

This is a 3-step process.
1) Various containerized materials are dropped into a hopper overlying a blender.
2) The blender mixes the solids content into a homogenous blend.
3) The blended material is discharged from the blender.
Each step generates particulate matter at a different rate identified by a unique emission factor.
The emissions from the two steps are summed to produce a total process emission rate.

PM is the only source of emissions in this process.
Dust is captured by a vacuum and sent to baghouse/filter control device.
AP-42 emission factors for talc are used instead of aggregate because the solids handled are closer in size to talc than they are to aggregate.

Operating Parameters

Description	Value	Units	Basis
Batch Size	3,000	lb/batch	-
Minimum Batch Time	2.5	hr/batch	-
Material Throughput	1,200	lb/hr	-
Potential Hours of Operations	8760	hr/yr	Maximum potential
Control Device	Baghouse Filter	-	-
Control Manufacture	Filter Holdings	-	product spec sheet
Control Efficiency	99.5%	-	product spec sheet

Maximum PM Emission Estimates

Source	Controlled Emission Factor [3] (lb PM/1000lbs of material)	Uncontrolled Hourly Rate (lb/hr)	Uncontrolled Potential Emissions (tpy)	Controlled Hourly Rate (lb/hr)	Controlled Potential Emissions (tpy)
Blender Charging [1]	0.0036	0.86	3.77	0.0043	0.019
Material Blending [2]	0.022	5.28	23.13	0.0264	0.116
Blender Discharging [1]	0.0036	0.86	3.77	0.0043	0.019
Total	0.029	7.00	30.66	0.0350	0.153

Uncontrolled Emission Factor 5.8 lb PM/1000 lb material

Notes

[1] Emission Factor from AP 42 Chapter 11.26 Talc Processing - Table 11.26.1 "Crushed talc storage bin loading, with fabric filter."
[2] Emission Factor from AP 42 Chapter 11.26 Talc Processing - Table 11.26.1 "Grinding, with fabric filter." This is a conservative emission factor as there is no action in a blender other than redistributing the solids into a homogeneous mixture and it is intended that a solid particle maintain its
[3] Talc emission factors selected are conservative because this material is not quite as fine as talc.

Methodology

Controlled Hourly Rate (lb/hr) = Material Throughput (lb/hr) * Emission Factor (lb PM/1000lbs of material)
Uncontrolled Hourly Rate (lb/hr) = Controlled Hourly Rate (lb/hr) / (1 - Control Efficiency %)
Controlled or Uncontrolled Potential Emissions (tpy) = Hourly Rate (lb/hr) * Hours of operation (hr/yr) * (1ton/2000lbs)

Conversions

1ton = 2,000lb

Shamrock Technologies
301 Community Dr
Henderson, KY
Blender Controlled PM Allowable Limit

Allowable PM Emissions per Section 3(2) of 401 KAR 59:010

Maximum Material Throughput (lb/hr)	Maximum Material Throughput (ton/hr)	Maximum Allowable Controlled Emission Rate [1] (lb/hr)	Maximum Actual Emission Rate [2] (lb/hr)	Maximum Allowable Emission Rate [3] (ton/yr)
1,200	0.60	2.62	0.035	11.46

Notes

[1] Maximum Allowable Emission Rate (lb/hr) = 3.59 * (Maximum Material Throughput (ton/hr) ^ 0.62) for processing rates of 1,000lb/hr to 60,000 lb/hr. For Processing rates ≤ 1,000 lb/hr, the allowable limit is 2.34 lb PM/hr.

[2] This represents the blender controlled emission rate.

[3] This represents the regulatory maximum allowable emission rate projected over 8760 hours per year in terms of tons per year.