From:	Air.Pollution Control
To:	APC Permitting
Subject:	FW: Application for Production Air Permit for Hormann LLC
Date:	Tuesday, November 3, 2020 4:05:55 PM
Attachments:	Production Air Permit for Hormann LLC.pdf

From: Ethan, Herman <e.herman@hormann.us>
Sent: Tuesday, November 3, 2020 15:26
To: Air.Pollution Control <Air.Pollution.Control@tn.gov>
Cc: Collin Scherdell <Collin@stevensenvironmental.com>; Shea Cofer (shea@stevensenvironmental.com) <shea@stevensenvironmental.com>
Subject: [EXTERNAL] Application for Production Air Permit for Hormann LLC

To Whom It May Concern,

I am submitting this application for the production air permit on behalf of Hormann LLC. If there are any questions or concerns please let me know. Thank you.

Sincerely,

Ethan Herman
Engineering Department Manager
Hörmann LLC
450 Airport Rd
Sparta, TN 38583

Mobile: 630.788.3093
Fax: 630.859.8122

November 3, 2020

Division of Air Pollution Control
Tennessee Department of Environment & Conservation
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, TN 37243

Subject: Hormann LLC
True Minor Operating Permit Application
ESRN: 93-0118

Greetings:

With this letter, Hormann LLC submits an operating permit application and initial startup certification for Source 02 and requests extension to the current construction permit for Source 03. The facility in Sparta, TN currently holds Construction Permit 974979. The facility has five (5) emission sources as outlined in the table below. Insignificant sources were approved in the letter from TDEC dated December 19, 2018 and are therefore exempt from permitting.

Source	Status
01, 04, 05	Insignificant
02	Installation complete. Hormann is submitting an operating permit application and startup certification for this source.
03	Not yet installed. Hormann LLC requests an extension to Construction Permit 974979 for installation of this source.

Hormann started production on Source 02 on October 5, 2020 as indicated on the attached startup certification page. This operating permit application is being submitted in a timely manner in accordance with Condition G11 of permit 974979. Hormann understands that the operation may continue under the construction permit since the application was submitted within 30 days of startup.

A conversation between Jerry Swinea of TDEC and Shea Cofer, environmental consultant, occurred on October 23, 2020, in which it was discussed that Hormann should request the operating permit for Source 02 and request an extension to the construction permit for Source 03. Hormann requests that the construction permit for Source 03 be extended until January 2023. A separate startup certification and operating application will be submitted within 30 days of startup of Source 03.

The calculations included in this application for Source 02 include window cutting. This is an enclosed milling process which has a small dust collector vacuum for industrial hygiene purposes.

Startup certification, application pages, process flow diagram, and emission calculations are attached. If you have questions or comments, please contact Ethan Herman, Engineering Manager at (423) 337-3993, or my consultant, Shea Cofer at (615) 418-1414.

I hereby certify that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

Sincerely,

Camron Rudd
President

Attachments: Source 02 Startup Certification
Source 02 Operating Permit Application

Source 02 Operating Permit Application

DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF AIR POLLUTION CONTROL
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor, Nashville, TN 37243
Telephone: (615) 532-0554, Email: Air.Pollution.Control@TN.gov

NON-TITLE V PERMIT APPLICATION
FACILITY IDENTIFICATION

Type or print and submit. Attach appropriate source description forms.

SITE INFORMATION

1. Organization's legal name and SOS control number [as registered with the TN Secretary of State (SOS)]
Hormann LLC 000932606

2. Site name (if different from legal name)

3. Is a construction permit application fee being submitted? Yes ☐ No ☑
(see instructions for appropriate fee to submit)

4. Site address (St./Rd./Hwy.)		County name
450 Airport Road		White
City	Zip code	**5.** NAICS or SIC code
Sparta	38583	332321

6. Site location (in lat. /long.)	Latitude	Longitude
	36.05565 N	85.52171 W

CONTACT INFORMATION (RESPONSIBLE PERSON)

7. Responsible person/Authorized contact			Phone number with area code
Camron Rudd			(630) 859-3000
Mailing address (St./Rd./Hwy.)			Fax number with area code
450 Airport Road			
City	State	Zip code	Email address
Sparta	TN	38583	

CONTACT INFORMATION (TECHNICAL)

8. Principal technical contact			Phone number with area code
Ethan Herman			(630) 859-3000 ext. 160
Mailing address (St./Rd./Hwy.)			Fax number with area code
450 Airport Road			(630) 859-8122
City	State	Zip code	Email address
Sparta	TN	38583	e.herman@hormann.us

CONTACT INFORMATION (BILLING)

9. Billing contact			Phone number with area code
Mailing address (St./Rd./Hwy.)			Fax number with area code
City	State	Zip code	Email address

AIR CONTAMINANT SOURCE(S) INFORMATION

10. Description of air contaminant source(s) and Unique Source ID(s). List, identify, and briefly describe process emission sources, fuel burning installations, and incinerators that are contained in this application and include a Unique Source ID for each source. The Unique Source ID is a name/number/letter, which uniquely identifies the air contaminant source(s), like Boiler #1, Paint Line #1, Engine #1, etc. (see instructions for more details)

The Garage Door Manufacturing facility has 5 processes which are potential air contaminant sources. Three qualified as insignificant activities as stated in the letter from TDEC dated December 19, 2018. They are therefore exempt from permitting. Two permitted emission sources are listed below. This application is for an operating permit including Source 02. Source 03 has not been installed, so it is not included in this application. Source 03 will remain covered by a requested extension to the existing construction permit 974979 until it is installed.

Source	Description
02	EPS Foam Panel Imprinting and Gluing

11. Is the air contaminant source(s) in a nonattainment area? If "Yes", then minor source BACT must be addressed. Yes ☐ No ☑

12. Normal operation:	Hours/Day 24	Days/Week 7	Weeks/Year 52	Days/Year 365
13. Percent annual throughput	Dec. – Feb. 25	March – May 25	June – August 25	Sept. – Nov. 25

TYPE OF PERMIT REQUESTED (check appropriate box)

14. Operating permit ☑	Date construction started September 2018	Date completed Oct 2020	Date of ownership change (if applicable)
	Last permit number(s) Construction Permit 974979	Emission Source Reference Number(s) 93-0118-02	
Construction permit ☐	Last permit number(s)	Emission Source Reference Number(s)	

If you chose Construction permit above, then choose either New Construction, Modification, or Location Transfer

New Construction ☐	Starting date	Completion date
Modification ☐	Date modification started or will start	Date completed or will complete
Location Transfer ☐	Transfer date	Address of last location

15. Describe changes that have been made to this equipment or operation(s) since the last construction or operating permit application:

Potential production volumes have been updated since the construction application. The new volumes are reflected in the attached emission calculations.

An additional adhesive process has been added to the Source 02 emission calculations, which has the potential to contribute 0.14 tpy VOC.

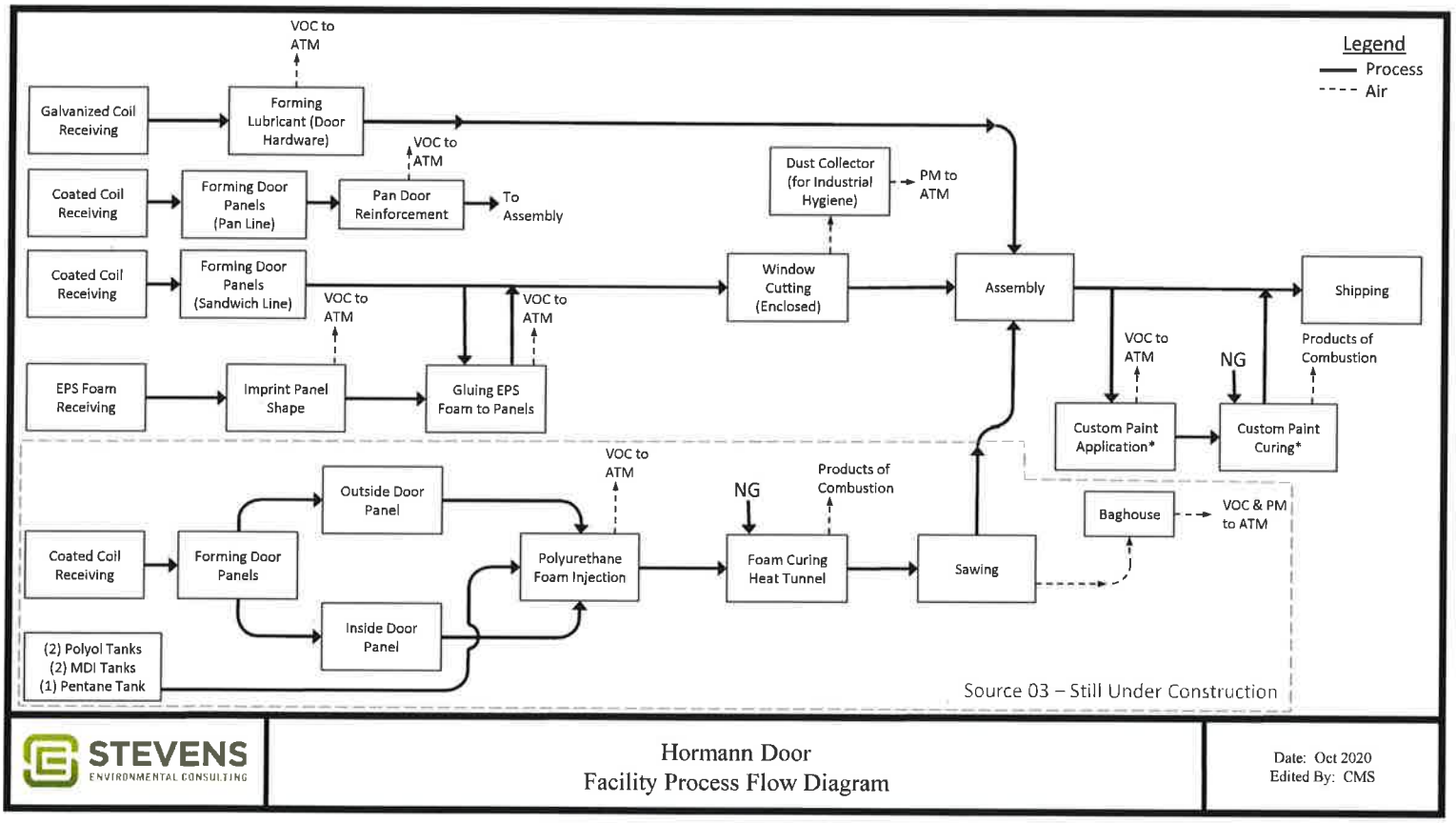
16. Comments

Note that the address for this facility has changed from 420 Airport Rd, as written on the construction permit, to 450 Airport Rd. The physical location has not changed.

SIGNATURE

Based upon information and belief formed after a reasonable inquiry, I, as the responsible person of the above mentioned facility, certify that the information contained in this application is accurate and true to the best of my knowledge. As specified in TCA Section 39-16-702(a)(4), this declaration is made under penalty of perjury.

17. Signature (application must be signed before it will be processed)		**Date**
		3 Nov. 2020
Signer's name (type or print)	**Title**	**Phone number with area code**
Cameron Rudd	President, Hermann LLC	630-518-0623



STEVENS ENVIRONMENTAL CONSULTING

Hormann Door
Facility Process Flow Diagram

Date: Oct 2020
Edited By: CMS

DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF AIR POLLUTION CONTROL
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor, Nashville, TN 37243
Telephone: (615) 532-0554, Email: Air.Pollution.Control@TN.gov

NON-TITLE V PERMIT APPLICATION
EMISSION POINT DESCRIPTION

Type or print and submit for each stack or air contaminant source. Submit with the APC 100.

GENERAL IDENTIFICATION AND DESCRIPTION

1. Organization's legal name and SOS control number [as registered with the TN Secretary of State (SOS)]
Hormann LLC 000932606

2. Unique Source ID (name/number/letter which uniquely identifies this air contaminant source, like Boiler #1)
02: EPS Foam Panel Imprinting and Gluing

3. Unique Emission Point ID (name/number/letter which uniquely identifies this emission point, like Stack #1)
02-1 and additional fugitive emissions (see comment)

4. Brief description of air contaminant source (Attach a diagram if appropriate):
EPS Foam Panel Imprinting and Gluing Operation: EPS foam panels are imprinted or embossed to the shape of the garage door. Emissions are from the foam burned away in the impressions and gluing to the metal door panels.

5. Emission point location	Latitude	Longitude	**6. Distance to nearest property line (Ft.)**
	36.05565 N	85.52171 W	300

STACK AND EMISSION DATA

7. Stack or emission point data: →	Height above grade (Ft.)	Diameter (Ft.)	Temperature (°F)	% of time over 125°F	Direction of exit (Up, down or horizontal)
	45	2.12	Ambient	0	Up

Data at exit conditions: →	Flow (actual $Ft.^3$/Min.)	Velocity (Ft. /Sec.)	Moisture ($Grains/Ft.^3$)	Moisture (Percent)
	10,600 ACFM	50	Ambient	Ambient
Data at standard conditions: →	Flow (Dry std. $Ft.^3$/Min.)	Velocity (Ft. /Sec.)	Moisture ($Grains/Ft.^3$)	Moisture (Percent)
	10,600	50	Ambient	Ambient

8. Monitoring device and recording instrument (check all that apply):

Opacity monitor	SO_2 monitor	NO_X monitor	Strip chart	Electronic data logger	Other (specify in comments)	No monitor (none)
☐	☐	☐	☐	☐	☐	☑

9. Control device. Description of proposed monitoring, recordkeeping, and reporting to assure compliance with emission limits. Include operating parameters of control device (flow rate, temperature, pressure drop, etc.).
None.

10. Air contaminants. Emission estimates for each air contaminant emitted from this point should be based on stack sampling results or engineering calculations. Calculations should be attached on a separate sheet. (see instructions for more details)

Air contaminants	Average Emissions (Lbs./Hr.)	Maximum Emissions (Lbs./Hr.)	Concen-tration	Average Emissions (Ton/Yr.)	Potential Emissions (Ton/Yr.)	Emissions Estimation Method Code *	Control Devices *	Control Effi-ciency %
Particulate matter (PM)	0.002	0.002	**	0.01	0.01			
Sulfur dioxide (SO_2)			***					
Carbon monoxide (CO)			PPM					
Volatile organic compounds (VOC)	0.99	0.99	PPM	4.98	4.98	2	000	N/A
Nitrogen oxides (NO_X)			PPM					
Hydrogen fluoride (HF)								
Hydrogen chloride (HCl)								
Lead (Pb)								
Greenhouse gases (CO_2 equivalents)								
Hazardous air pollutant (specify) MDI (101-68-8)	0.71	0.71		3.10	3.10	2	000	N/A
Hazardous air pollutant (specify) Styrene (100-42-5)	0.007	0.007		0.03	0.03	2	000	N/A
Hazardous air pollutant (specify)								
Hazardous air pollutant (specify)								
Hazardous air pollutant (specify)								
Other (specify)								
Other (specify)								
Other (specify)								
Other (specify)								

11. Comments

Emissions from foam panel imprinting have a dedicated ventilation point. Gluing operation emissions are fugitive. There is not a control device for either process.

SIGNATURE

If this form is being submitted at the same time as an APC 100 form, then a signature is not required on this form. Date this form regardless of whether a signature is provided. If this form is NOT being submitted at the same time as an APC 100 form, then a signature is required.

Based upon information and belief formed after a reasonable inquiry, I, as the responsible person of the above mentioned facility, certify that the information contained in this application is accurate and true to the best of my knowledge. As specified in TCA Section 39-16-702(a)(4), this declaration is made under penalty of perjury.

12. Signature		**Date**
Signer's name (type or print)	**Title**	**Phone number with area code**

* Refer to the tables in the instructions for estimation method and control device codes.

** Exit gas particulate matter concentration units: Process – Grains/Dry Standard Ft^3 (70^0F), Wood fired boilers - Grains/Dry Standard Ft^3 (70^0F), all other boilers – Lbs. /Million BTU heat input.

*** Exit gas sulfur dioxide concentrations units: Process – PPM by volume, dry bases, and boilers – Lbs. /Million BTU heat input

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NON-TITLE V PERMIT APPLICATION
PROCESS OR FUEL BURNING SOURCE DESCRIPTION

Type or print. Submit with the APC 100.

GENERAL IDENTIFICATION AND DESCRIPTION

1. **Organization's legal name and SOS control number** [as registered with the TN Secretary of State (SOS)]	2. **Emission Source Reference Number**
Hormann LLC 000932606	93-0118-02

3. Is this air contaminant source subject to an NSPS or NESHAP rule? Yes ☐ No ☑
If Yes, list rule citation, including Part, Subpart, and applicable Sections:

4. **Unique Source ID** (see instructions)	5. **Unique Emission Point ID** (see instructions)
02: EPS Foam Panel Imprinting and Gluing	Source 02 Fugitives

6. Description of air contaminant source

EPS Foam Panel Imprinting and Gluing: EPS foam panels are imprinted or embossed to the shape of the garage door. Emissions are from the foam burned away in the impressions and gluing to the metal door panels.

7. Type of air contaminant source (Check only one option to the right)

Process Emission Source: For each process emission source, submit a separate application. (Check at right and complete lines 8, 9, and 14)	☑
Process Emission Source with in process fuel: Products of combustion contact materials heated. For each process emission source, submit a separate application. (Check at right and complete lines 8 through 14)	☐
Non-Process fuel burning source: Products of combustion do not contact materials heated. Complete this form for each boiler or fuel burner and complete a Non-Title V Emission Point Description Form (APC 101) for each stack. (Check at right and complete lines 10 through 14)	☐

PROCESS EMISSION SOURCE DESCRIPTION AND DATA

8. **Type of operation:** Continuous ☑ Batch ☐	Normal batch time	Normal batches/day

9. **Process material inputs and In-process solid fuels**	Diagram reference	Input rates (pounds/hour) Design	Actual
A. N/A (Foam Panel Imprinting)	Source 02	N/A	N/A
B. PURMELT 513C GLUE	Source 02	7.07	7.07
C. Teroson MS 939NA Adhesive	Source 02	2.95	2.95
D.			
E.			
F.			
G.			
Totals		10.02	10.02

* A simple process flow diagram must be attached.

DESCRIPTION OF BOILER, BURNER, ENGINE, OR OTHER FUEL BURNING SOURCE

10. Boiler or burner data: (Complete lines 10 through 14 using a separate form for each boiler, burner, etc.)

Serial Number	Type of firing***	
Rated horsepower	Rated input capacity (10^6 BTU/Hr.)	Other rating (specify capacity and units)
Date constructed	Date manufactured	Date of last modification (explain in comments below)

** Source with a common stack will have the same stack number.
*** Cyclone, spreader (with or without reinjection), pulverized (wet or dry bottom, with or without reinjection), other stoker (specify type, hand fired, automatic, or other type (describe below in comments).

FUEL USED IN BOILER, BURNER, ENGINE, OR OTHER FUEL BURNING SOURCE

11. Fuel data: (Complete for a process emission source with in process fuel or a non-process fuel burning source)

Primary fuel type (specify)				Standby fuel type(s) (specify)				
Fuels used	Annual usage	Hourly usage		% Sulfur	% Ash	BTU value of fuel		(For APC use only) SCC code
		Design	Average					
Natural gas:	10^6 Cu. Ft.	Cu. Ft.	Cu. Ft.	////////// //////////	///// /////	1,000		
#2 Fuel oil:	10^3 Gal.	Gal.	Gal.		///// /////			
#5 Fuel oil:	10^3 Gal.	Gal.	Gal.		///// /////			
#6 Fuel oil:	10^3 Gal.	Gal.	Gal.		///// /////			
Coal:	Tons	Lbs.	Lbs.					
Wood:	Tons	Lbs.	Lbs.	////////// //////////	///// /////			
Liquid propane:	10^3 Gal.	Gal.	Gal.	////////// //////////	///// /////	85,000		
Other (specify type & units):								

12. If Wood is used as a fuel, specify types and estimate percent by weight of bark

13. If Wood is used with other fuels, specify percent by weight of wood charged to the burner.

14. Comments

SIGNATURE

If this form is being submitted at the same time as an APC 100 form, then a signature is not required on this form. Date this form regardless of whether a signature is provided. If this form is NOT being submitted at the same time as an APC 100 form, then a signature is required.

Based upon information and belief formed after a reasonable inquiry, I, as the responsible person of the above mentioned facility, certify that the information contained in this application is accurate and true to the best of my knowledge. As specified in TCA Section 39-16-702(a)(4), this declaration is made under penalty of perjury.

15. Signature		**Date**
Signer's name (type or print)	**Title**	**Phone number with area code**

Plantwide Production Data

Hormann Door

Sparta, Tennessee

Direct data entry

300,000		Potential Annual Production Volume
75,000	25%	Sandwich Doors
120,000	40%	Pan Doors
105,000	35%	Polyurethane Injection Doors
8,760		Operating Hours (production)
3,000		Gallons Annual Usage of Custom Paint
61,920		Pounds Annual Usage of EPS Foam Panel Glue (PUR 513C)
35		kg/hour Pentane consumption at full system speed
1,035		kg/hour Methylene Diphenyl Diisocyanate (MDI) consumption at full system speed
627		kg/hour Polyol consumption at full system speed

Max Foam Component / Blowing Agent Usage Rate			
Component	**(lb/month)**	**(lb/year)**	**(tpy)**
Pentane	56,328	675,930	338
MDI	1,665,686	19,988,226	9,994
Polyol	1,009,067	12,108,810	6,054
Total	**2,731,081**	**32,772,966**	**6,392**

Plantwide Emission Summary
Hormann Door
Sparta, TN

Source	Description	Criteria Poluttant Emissions (tpy)							CO2eq	Hazardous Air Pollutant (HAP) Emissions		
		TSP[2]	PM10[2]	PM2.5[2]	NOx	VOC	SO2	CO		Methylene Diphenyl Diisocyanate (MDI) CAS:101-68-8	Styrene CAS:100-42-5	Total HAPs
001 Insignificant	Forming Door Hardware	--	--	--	--	0.21	--	--	--	--	--	0.00
002	EPS Foam Panel Imprinting and Gluing Operation[1]	0.01	0.01	--	--	4.98	--	--	--	3.10	0.03	3.13
003[3]	Polyurethane Foam Injection, Heat Tunnel, and Sawing Operation	2.57	2.57	2.57	0.26	25.87	0.002	0.22	318.37	0.0007	--	0.0007
004 Insignificant	Custom Paint Application (Includes Paint Cure Oven Burner and Replacement Air Unit Combustion Emissions)	0.18	0.18	0.18	2.36	4.48	0.01	1.98	2,850.96	--	--	0.00
005 Insignificant	Fugitives: Blowing Agent Tank Recirc Loop Components	--	--	--	--	0.58	--	--	--	--	--	0.00
	Totals[1] =	**2.76**	**2.76**	**2.75**	**2.63**	**36.13**	**0.02**	**2.20**	**3,169.33**	**3.10**	**0.03**	**3.13**
	Totals Excluding Source 03 =	**0.19**	**0.19**	**0.18**	**2.36**	**10.25**	**0.01**	**1.98**	**2,850.96**	**3.10**	**0.03**	**3.13**

Note:
1) Source 002 VOC emission calculations based on maximum garage door production of 300,000 Doors per Year
2) TSP, PM10 and PM2.5 include filterable and condensable particulate matter.
3) Source 03 is not installed at the time of initial operating permit application for Source 02. Source 03 remains under Construction Permit 974979.

Source 001 (Insignificant)
Forming Door Hardware
VOC Emissions from Forming lubricant for galvanized coil forming (Insignificant Activity)

Operating Parameters
Hours of Operation 8,760 hrs/yr

Lubricant Name	Annual Usage (gal)	Material Density (lb/gal)	VOC Content (%)	VOC Emissions	
				lb/year	TPY
921 DS 1MO CANT RUST (M2)	55	7.089	90%	350.9	0.18
251 ROLL FILM	10	6.672	99%	66.1	0.03
				Total	**0.21**

Example Calculation:
VOC Emissions = Annual Usage (gal) x Material Density (lb/gal) x VOC Content (%)

Source 002

Imprinting Panel Shape in EPS Foam[1]

VOC Emissions from EPS Foam Loss during Imprinting Door Foam Panels.

EPS = Expanded Polystryene

Direct Data Entry

Operating Parameters		
Hours of Operation	8,760	hrs/yr
Ventilation Rate	10,600	CFM
Foam Loss Calculation:		
Number of impressions	24	Impressions per average 12 ft by 7 ft Door
Production Rate[1]	75,000	Doors produced per year
Foam Loss Rate (Volume)	0.0334	Ft^3 of foam is burned away per impression
Annual Imprinting EPS Foam Loss (Volume)	60,120	Ft^3 of foam burned away per year (from imprinting)
Assumed additional Foam loss from cutting and router	1.5%	Margin of Safety - from cutting panels with hot wire or routers for windows
Annual Total Foam Loss (volume)	61,022	Ft^3 of foam lost annually from imprinting and cutting

---

Emission Calculation:

EPS Foam Density	1.0	pcf or lb/ft^3	Nominally 1pcf per EPS Foam Tech Sheet
Tolerance for Density Variance	10%		
EPS Foam VOC Content	5%	per EPS Foam SDS from Pentanes	
EPS Foam HAP Content	0.10%	Styrene content per EPS Foam SDS	

Source Summary	VOC[2]		HAP (Styrene)	
	lb/hr	TPY	lb/hr	TPY
Emissions from EPS Panel Imprinting and Cutting	0.38	1.68	0.007	0.03

Notes and Example Calculation:

1) VOC emission calculations based on maximum garage door production of 300,000 Doors per Year

2) VOC emissions (TPY) = [EPS Foam Density (pcf) x Annual EPS Foam Loss from Imprinting and cutting (ft^3) x EPS Foam VOC Content(%)]/2,000 lb/ton

Source 002
EPS Foam Panel Gluing Emissions
VOC and HAP Emissions from Annual Usage of PURMELT Adhesive

Direct Data Entry

Operating Parameters
Hours of Operation 8,760 hrs/yr

	HAP Content	
PURMELT 513C GLUE contains	5%	Percent Methylenebis(phenylisocyanate). Also known as MDI. CAS number 101-68-8
Current Annual Usage of EPS Foam Panel Glue (PURMELT 513C)	61,920	Lbs per year
Multiplier for increased production	2	Assumed that at full capacity for 1 shift at the TN plant, production/glue usage doubles.

Source Summary	HAPs (VOC) from MDI	
	lb/hr	tpy
Emissions from Gluing EPS Foam to Door Panels	0.71	3.10

Example Calculation:

HAP Emissions from MDI (tpy) = [Annual usage of PURMELT 513C (lbs/yr) x Multiplier for increased production x HAP Content (%)] / 2,000 lb/ton

Source 002
EPS Foam Panel Gluing Emissions
VOC Emissions from Annual Usage of TEROSON MS 939NA Adhesive

Direct Data Entry

Operating Parameters		
Hours of Operation	8,760	hrs/yr
Production volume	120,000	Pan Doors
Adhesive VOC Content	1.62%	Per TEROSON MS 939NA GREY SDS
Adhesive Usage	0.216	lbs per pan door

Source Summary	HAPs (VOC) from MDI	
	lb/hr	tpy
Emissions from Gluing EPS Foam to Door Panels	0.05	0.21

Example Calculation:

VOC Emissions (tpy) = [Annual Door Production (Qty) x Adhesive Usage per Door (lb) x VOC Content (%)] / 2,000 lb/ton

Source 002
Window Cutting
This process is enclosed, and the dust collector is used for industrial hygiene.

Operating Hours	8,760	hr/yr	
Doors Per year	37,500	(assuming 50% receive windows)	
Max cut length / door	209	in	1008 X 317mm X 2
Cut width	0.39	in	
Max Foam Thickness	1.856	in	
Foam Density	1	lb/ft^3	
Foam Material Loss	2	tpy	
Steel Thickness	0.03	in	
Steel Density	500	lb/ft^3	
Steel Material Loss	13	tpy	

Dust Collector I.D.	Process Material Loss	Capture Efficiency[1]	Control Efficiency[2]	Interior Settling Factor[3]	PM	
					lb/hr	tpy[4]
Window Cutting DC	15	100%	99.9%	50%	0.002	0.01

Example Calculations and Notes:
(1) Closed Process
(2) Engineering estimate
(3) Dust Collector exhausts inside the building
(4) Emissions = Process Material Loss * Capture Efficiency * (1-Control Eff.) * (1-Settling Factor)

Source 003
Polyurethane Foam Injection
VOC emissions from blowing agent, MDI

VOC (Pentane) Emissions

Development of Emission Factor

	Direct data entry	
Average Pentane (blowing agent) added	77.16	lb/hr
Assumed Pentane Released in Manufacturing	7.5%	Note 1
Average inlet mass to ATM	5.79	lb/hr
Emission Factor	0.075	lb VOC to ATM/lb Pentane added

VOC Emissions from Manufacturing

Maximum Annual Pentane Usage (Blowing Agent added to process) (lbs/yr)	Emission Factor	VOC Emissions (lbs/yr)	VOC Emissions (TPY)
675,930	0.075	50,695	25.35

Notes and Example Calculation:
1) Conservative Estimate based upon engineering judgement and testing results in similar industry processes
2) VOC Emissions (TPY) = [Maximum Pentane Added(lbs/yr) x Emission Factor(lb VOC to ATM/lb Pentane added)]/2,000 lb/tor

Fugitive Emissions MDI - HAPs

MDI Calculations RCAP Combined
Page 104 (App A) Vapor Pressure / Temperature chart
Page 109 (App B) Vapor Pressure Adjustment Factors (K)

Emission Calculation Development (MDI)

Average Foam Injection rate	3,741	lb/hr
MDI Introduced	2,282	lb/hr
L_c (MDI Emissions) =	1.2621	lb/yr
Margin of Compliance[1] =	15%	
L_c (MDI Emissions) =	1.4514	lb/yr

Equation for Calculating Stack Emissions of MDI from Doors
Section 10.0 page 5-25 of MDI Emissions Reporting Guidelines for the Polyurethanes Industry
Lc = Vair * (1 / 359) * (273.15 / Tproc) * (VPMDI / 760) * Mw * KMDI

Tproc =	158	°F (or 70°C in the polyurethane line heat tunnel)
Tproc =	343.15	K
VP_{MDI} =	1.36E-03	mm Hg per App A MDI Emissions Reporting Guidelines...
Mw =	250.26	this is the molecular weight of MDI
K_{MDI} =	0.659	adjustment factor (function of MDI Concentration in feedstock and temperature) App B MDI Emissions Reporting Guidelines...
359	359	the molar volume of an ideal gas in ft^3/lb-mole @ 0°C and 1-atmosphere

Mixture = 61% MDI 61.0%

Vair (Annual Volume of Air Displaced)

Door Section Volume		
Avg. Section Height	21	inch
Avg. Section Thickness	1.75	inch
Avg. Section Width	12	ft
Volume per section	3.0625	ft^3
Average Door Number of sections	6	sections / garage door
Production rate Number of sections/yr	630,000	sections/year
Annual Volume of Air displaced = Vair =	1,929,375	ft^3

MDI Emissions Calculations

Max. MDI Usage (lbs/yr)	MDI Fugitive Emissions (lb/yr)	MDI Fugitive Emissions (tpy)
19,988,226	1.45	0.0007

Notes:
(1) Based on process knowledge, variability is estimated at 10%. A conservative value of 15% is used in calculations. This value may be adjusted in the future as additional emissions data is obtained.

Source 003
Heat Tunnel For Polyurethane Foam Injection Line

Operating Parameters

Fuel Type Natural Gas

Unit Description	Maximum Firing Rate (MMBtu/hr)	
Heat Tunnel for Polyurethane Foam Injection	0.614	MMBtu/hr
Operating hours	8,760	hr/yr

Annual Fuel Usage	Natural Gas		Hourly Usage	
Heat Tunnel	5	MMCF/yr	602	Cu. Ft./hr

Emission Calculations

Emission Factors for Natural Gas Combustion [1,2]

	lb/10^6 scf	lb/MMBtu-HHV	
Particulate Matter (PM_{Total})	7.6	0.0075	AP-42
Particulate Matter (PM_{Cond})	5.7	0.0056	AP-42
Particulate Matter (PM_{Filter})[3]	1.9	0.0019	AP-42
Nitrogen Oxides (NO_x)	100	0.0980	AP-42
Carbon Monoxide (CO)	84	0.0820	AP-42
Sulfur Dioxide (SO_2)	0.6	0.0006	AP-42
VOC	5.5	0.0054	AP-42
Carbon Dioxide (CO_2)	120,000	117.65	AP-42
Methane (CH_4)	2.3	2.255E-03	AP-42
Nitrous Oxide (N_2O)	2.2	2.157E-03	AP-42

Natural Gas Emissions

Heat Tunnel

	lb/hr	Annual [4,5] ton/year
Particulate Matter (PM_{Total})[3]	0.00	0.02
Particulate Matter (PM_{10})[3]	0.00	0.02
Particulate Matter ($PM_{2.5}$)[3]	0.00	0.02
Nitrogen Oxides (NO_x)	0.06	0.26
Carbon Monoxide (CO)	0.05	0.22
Sulfur Dioxide (SO_2)	0.000	0.00
Combustion VOC	0.00	0.01
Carbon Dioxide (CO_2)	72	316
Methane (CH_4)	0.00	0.01
Nitrous Oxide (N_2O)	1.32E-03	0.006
CO_2 Equivalent (CO_2eq)[7]	--	318

GWP[6]	
CH4	25
N2O	298

Example Calculations/Notes:

(1) Compilation of Air Pollutant Emission Factors, AP-42, Supplement D, Fifth Edition, Section 1.4, Tables 1.4-1 and 1.4-2, July 1998, Small Boilers < 100 MMBtu/hr

(2) Per AP-42, Table 1.4-1 and 1.4-2, to convert from lb/10^6 scf to kg/10^6 m^3, multiply by 16. To convert from lb/10^6 scf to lb/MMBtu, divide by 1,020.

(3) Assume $PM_{Total} = PM_{2.5} = PM_{10}$. (Includes filterable and condensable particulate matter)

(4) Maximum Emissions (lb/hr) = Emission Factor (lb/MMscf) * Natural Gas Usage (MMCF)

(5) Annual Emissions (tpy) = Average Emissions (lb/hr) * 8,760 (hr/yr) / 2,000 (lb/ton)

(6) GWP from 40 CFR 98 Subpart A Table A-1

(7) CO_2 Equivalent (CO_2eq) = CO_2 + [GWP_{CH4} * CH_4] + [GWP_{N2O} * N_2O]

Source 003
Polyurethane Foam Injection Line Sawing Operation: VOC released to Dust Collector

Operating Parameters
Hours of Operation 8,760 hrs/yr

Maximum Potential to Emit - VOC

Maximum Annual Pentane Usage (lbs/yr)	VOC Loss at Manufacturing (lbs/yr)	VOC Available at Sawing[1] (lbs/yr)	Section Foam Trimmed[2,3] (%)	VOC Emissions[4,5] (lbs/yr)	(tpy)	lb/hr
675,930	50,695	625,236	0.16%	1,026	0.51	0.12

Notes:
(1) VOC Available at Sawing (lbs) = Max Blowing Agent VOC (lbs) - VOC Loss at Manufacturing (lbs)
(2) The maximum cut volume is determined first by calculating the trim from each side of the garage door section. As indicated, automated saws trim the edges of the doors, trimming approximately 3mm from each side. Average Garage door section width is 12 ft, average section height is 21 inch, and the average section thickness is 1.75 inch. All saw cut emissions are collected and routed to the baghouse dust collector. The table below contains a detailed calculation of the overall cut volume.
(3) Assume that the mass of trimmed door section is proportional to volume (0.16%).
(4) VOC Emissions (lbs) = VOC Available at Sawing (lbs) * Section Foam Trimmed (%) / 100
(5) VOC Emissions (tons) = VOC Emissions (lbs) / 2000

Door Section Volume		
Avg. Section Height	21	inch
Avg. Section Thickness	1.75	inch
Avg. Section Width	12	ft
Volume of Untrimmed Section	3.06	ft^3
Volume of Section Trimmed		
Saw Kerf	3	mm
Volume Trimmed/cut	0.0025	ft^3
Number of cuts per section	2	cuts
Percentage of Total Volume	**0.16%**	

Source 003
Sawing Dust Collector Emissions

Operating Hours 8,760 hr/yr

Baghouse I.D.	Flow Rate (ACFM)	Exhaust Diameter (ft)	Exhaust Cross-Sectional Area (ft^2)	Exit Velocity (ft/sec)	Exit Velocity (ft/min)	Exit Temp (F)	Moisture Content %	Flow Rate[1] (DSCFM)	Exhaust PM Conc. (gr/dscf)	PM	
										lb/hr[2]	tpy[3]
Sawing DC	3,531	1.00	0.79	74.9	4496.4	80	2.0%	3,397	0.02	0.58	2.55

Example Calculations and Notes:
(1) Flow Rate (DSCFM) = (ACFM x ((460+70)/(460 + Exit Temp))) x (1 - Moisture Content)
(2) PM Emissions (lb/hr) = DSCFM x Exhaust PM Conc. x 60 (min/hr) x (1 lb / 7000 grains)
(3) PM Emissions (tpy) = (PM Emissions (lb/hr) x 8760 (hr/yr)) / (2000 (lb/ton))

Source 004 (Insignificant)
Custom Paint Application
VOC Emissions from Annual Usage of Custom Paint

Direct Data Entry

Operating Parameters
Hours of Operation 8,760 hrs/yr

	VOC Content	
Carbithane 11 Series Low VOC Coatings	2.9	lb/gal per Product Data Sheet

Custom Paint Application Annual Usage 3,000 Gallons per year

Source Summary	VOC	
	lb/hr	TPY
Emissions from Custom Paint Application	0.99	4.4

Example Calculation:
VOC emissions (tpy) = Coating VOC Content (lb/gal) x Coating Annual Usage (gal/yr) / 2,000 lb/ton

Source 004 (insignificant)
Custom Paint Cure Oven

Operating Parameters

Fuel Type Natural Gas

Unit Description	Maximum Firing Rate (MMBtu/hr)	
Custom Paint Cure Oven Burner	2.50	MMBtu/hr
Operating hours	8,760	hr/yr

Annual Fuel Usage	Natural Gas		Hourly Usage	
Custom Paint Cure Oven Burner	21	MMCF/yr	2,451	Cu. Ft./hr

Emission Calculations

Emission Factors for Natural Gas Combustion [1,2]

	lb/10^6 scf	lb/MMBtu-HHV	
Particulate Matter (PM_{Total})	7.6	0.0075	AP-42
Particulate Matter (PM_{Cond})	5.7	0.0056	AP-42
Particulate Matter (PM_{Filter})[3]	1.9	0.0019	AP-42
Nitrogen Oxides (NO_x)	100	0.0980	AP-42
Carbon Monoxide (CO)	84	0.0820	AP-42
Sulfur Dioxide (SO_2)	0.6	0.0006	AP-42
VOC	5.5	0.0054	AP-42
Carbon Dioxide (CO_2)	120,000	117.65	AP-42
Methane (CH_4)	2.3	2.255E-03	AP-42
Nitrous Oxide (N_2O)	2.2	2.157E-03	AP-42

Natural Gas Emissions

Custom Paint Cure Oven

	lb/hr	Annual [4,5] ton/year
Particulate Matter (PM_{Total})[3]	0.02	0.08
Particulate Matter (PM_{10})[3]	0.02	0.08
Particulate Matter ($PM_{2.5}$)[3]	0.02	0.08
Nitrogen Oxides (NO_x)	0.25	1.07
Carbon Monoxide (CO)	0.21	0.90
Sulfur Dioxide (SO_2)	0.001	0.01
Combustion VOC	0.01	0.06
Carbon Dioxide (CO_2)	294	1,288
Methane (CH_4)	0.01	0.02
Nitrous Oxide (N_2O)	5.39E-03	0.024
CO_2 Equivalent (CO_2eq)[7]	--	1,296

GWP[6]	
CH4	25
N2O	298

Example Calculations/Notes:

(1) Compilation of Air Pollutant Emission Factors, AP-42, Supplement D, Fifth Edition, Section 1.4, Tables 1.4-1 and 1.4-2, July 1998, Small Boilers < 100 MMBtu/hr

(2) Per AP-42, Table 1.4-1 and 1.4-2, to convert from lb/10^6 scf to kg/10^6 m^3, multiply by 16. To convert from lb/10^6 scf to lb/MMBtu, divide by 1,020.

(3) Assume $PM_{Total} = PM_{2.5} = PM_{10}$. (Includes filterable and condensable particulate matter)

(4) Maximum Emissions (lb/hr) = Emission Factor (lb/MMscf) * Natural Gas Usage (MMCF)

(5) Annual Emissions (tpy) = Average Emissions (lb/hr) * 8,760 (hr/yr) / 2,000 (lb/ton)

(6) GWP from 40 CFR 98 Subpart A Table A-1

(7) CO_2 Equivalent (CO_2eq) = CO_2 + [GWP_{CH4} * CH_4] + [GWP_{N2O} * N_2O]

Source 004 (Insignificant)
Misc. Combustion Sources - Heat Tunnel for Polyurethane Foam Injection; Custom Paint Cure Oven Burner; Air Replacement Unit

Operating Parameters

Fuel Type Natural Gas

Unit Description	Maximum Firing Rate (MMBtu/hr)	
Replacement Make-up Air Unit	3.00	MMBtu/hr
Operating hours	8,760	hr/yr

Annual Fuel Usage	Natural Gas		Hourly Usage	
Replacement Make-up Air Unit	26	MMCF/yr	2,941	Cu. Ft./hr

Emission Calculations

Emission Factors for Natural Gas Combustion [1,2]

	lb/10^6 scf	lb/MMBtu-HHV	
Particulate Matter (PM_{Total})	7.6	0.0075	AP-42
Particulate Matter (PM_{Cond})	5.7	0.0056	AP-42
Particulate Matter (PM_{Filter})[3]	1.9	0.0019	AP-42
Nitrogen Oxides (NO_x)	100	0.0980	AP-42
Carbon Monoxide (CO)	84	0.0820	AP-42
Sulfur Dioxide (SO_2)	0.6	0.0006	AP-42
VOC	5.5	0.0054	AP-42
Carbon Dioxide (CO_2)	120,000	117.65	AP-42
Methane (CH_4)	2.3	2.255E-03	AP-42
Nitrous Oxide (N_2O)	2.2	2.157E-03	AP-42

Natural Gas Emissions

Replacement Air Make-up Unit

	lb/hr	Annual [4,5] ton/year
Particulate Matter (PM_{Total})[3]	0.02	0.10
Particulate Matter (PM_{10})[3]	0.02	0.10
Particulate Matter ($PM_{2.5}$)[3]	0.02	0.10
Nitrogen Oxides (NO_x)	0.29	1.29
Carbon Monoxide (CO)	0.25	1.08
Sulfur Dioxide (SO_2)	0.002	0.01
Combustion VOC	0.02	0.07
Carbon Dioxide (CO_2)	353	1,546
Methane (CH_4)	0.01	0.03
Nitrous Oxide (N_2O)	6.47E-03	0.028
CO_2 Equivalent (CO_2eq)[7]	--	1,555

GWP[6]	
CH4	25
N2O	298

Example Calculations/Notes:

(1) Compilation of Air Pollutant Emission Factors, AP-42, Supplement D, Fifth Edition, Section 1.4, Tables 1.4-1 and 1.4-2, July 1998, Small Boilers < 100 MMBtu/hr

(2) Per AP-42, Table 1.4-1 and 1.4-2, to convert from lb/10^6 scf to kg/10^6 m^3, multiply by 16. To convert from lb/10^6 scf to lb/MMBtu, divide by 1,020.

(3) Assume $PM_{Total} = PM_{2.5} = PM_{10}$. (Includes filterable and condensable particulate matter)

(4) Maximum Emissions (lb/hr) = Emission Factor (lb/MMscf) * Natural Gas Usage (MMCF)

(5) Annual Emissions (tpy) = Average Emissions (lb/hr) * 8,760 (hr/yr) / 2,000 (lb/ton)

(6) GWP from 40 CFR 98 Subpart A Table A-1

(7) CO_2 Equivalent (CO_2eq) = CO_2 + [GWP_{CH4} * CH_4] + [GWP_{N2O} * N_2O]

Source 05 (Insignificant)
Blowing Agent Component Fugitive Emissions

Operating Parameters
Hours of Operation 8,760 hrs/yr

The blowing agent tank has a recirculating pump and loop that runs continually. The process draws blowing agent off this loop as required for production. The loop fittings are included.
Fugitive blowing agent emissions from leaks in the transfer lines and the process piping were calculated using US EPAs publication
"Fugitive VOC Emissions in the Synthetic Organic Chemical Manufacturing Industry (SOCMI)", December 1984 (EPA-625/10-84-004) Emission Factors
The factors presented in the original publication were revised based on June 1994 guidance from the Texas Natural Resource Conservation Commission (TNRCC).
The most conservative factors (i.e. light liquids) were used to represent blowing agent. The emission factors are as follows:

Valves	0.0035	lb/hr/component			
Pump Seals	0.0386	lb/hr/component			
Flanges	0.0005	lb/hr/component			
Relief Valves**	0.22963	lb/hr/component	**	0	lb/hr/component

Hormann expects that the blowing agent transfer and process system will consist of a maximum of 2 pumps, 27 flanged connections, 12 valves, and 2 relief valves.
**Because each tank will operate under pressure, there are assumed to be no emissions from pressure relief valves.
Therefore, the minimum expected emissions from blowing agent transfer lines and process piping are:

Components	# of Components	% VOC in Blowing Agent	Emission Factor (lb/hr/component)	VOC Emissions[1,2] (lb/hr)	(lb/yr)	(tpy)
Valves	12	100%	0.0035	0.04	368	0.18
Pump Seals	2		0.0386	0.08	676	0.34
Flanges	27		0.0005	0.01	118.3	0.06
Relief Valves	5		0	0.00	0.0	0.00
			Total =	**0.13**	**1,162**	**0.58**

Notes:
(1) VOC Emissions (lbs) = # of Components * % VOC in Blowing Agent (%) * Emission Factor (lb/hr/component) / 100
(2) VOC Emissions (tpy) = VOC Emissions (lb/yr) / 2000 (lb/ton)